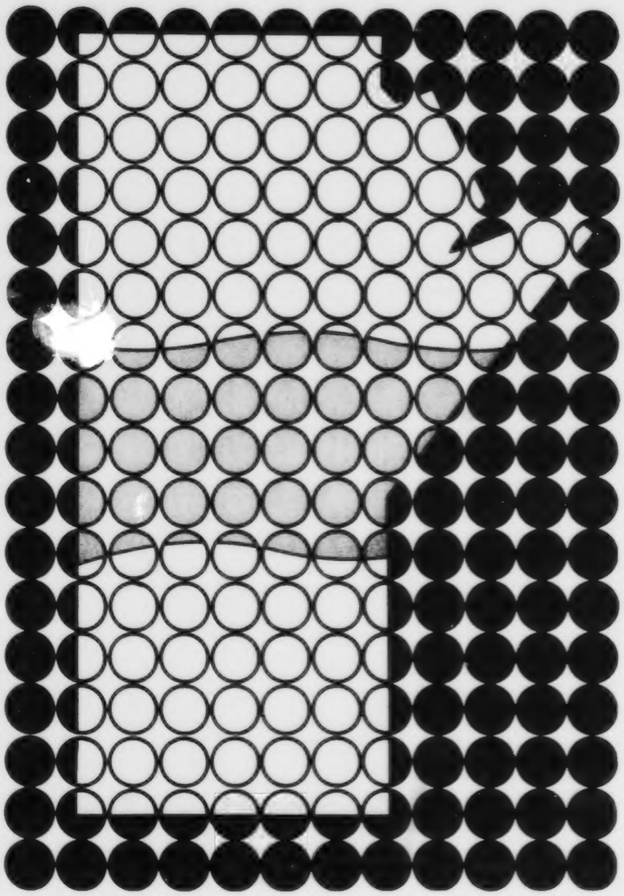


CANADA — MANITOBA
Soil Survey

Soils of the R.M. of Victoria

Report D75

Government of Canada Gouvernement du Canada
Government of Manitoba Gouvernement du Manitoba

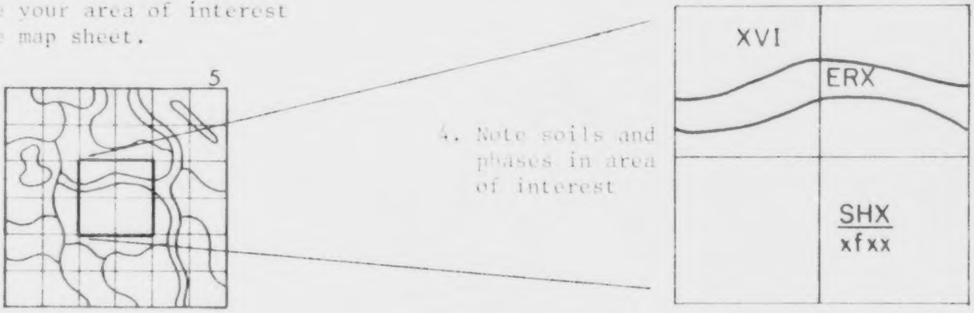
How To Use This Soil Report

1. Locate area of interest on "Index of Map Sheets" (pg. 149 or on folder pocket)

2. Note Map Sheet Number and select that sheet from map pocket.

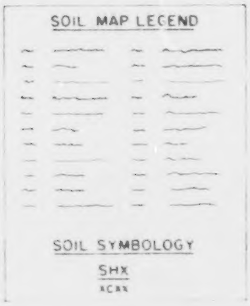
9
8
7
TP 9
Spruce Woods
4
5
6
TP 8
Holland
3
2
1
TP 7
Landseer
Cypress River
R 12
R 11
R 10
5

3. Locate your area of interest on the map sheet.


5
XVI
ERX
SHX
xfxx

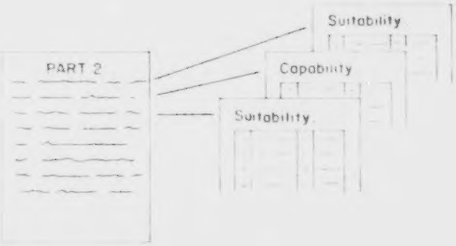
4. Note soils and phases in area of interest

5\.


SOIL MAP LEGEND
SOIL SYMBOLOGY
SHX

Check soil map legends (Table 2 and Table 3) and Section 1 of the soil report for description of soils and for an interpretation of soil map symbols.

6. Turn to part 2 of the report for performance or suitability ratings for the soils of interest in your area.


PART 2
Suitability
Capability
Suitability

7. Consult Part 1 of report if general information pertaining to the study area is required.

SOILS REPORT NO. D75 1989

SOILS OF THE RURAL MUNICIPALITY OF VICTORIA

by

M.N. LANGMAN

CANADA-MANITOBA SOIL SURVEY

AGRICULTURE CANADA

MANITOBA DEPARTMENT OF AGRICULTURE

DEPARTMENT OF SOIL SCIENCE, UNIVERSITY OF MANITOBA

90-00438/

PREFACE

This is a report of the inventory of the soils within the Rural Municipality of Victoria. It is another in a series of reports dealing with the continuing more detailed study of soils in southern Manitoba. The projected more intensive use of soils for agriculture and the growing competition for other uses of land in the area has created a need for up-to-date, more accurate and more detailed information. The increased examination of soils in the field, the use of current aerial photography, the use of improved methods of analyzing soils in the laboratory and the accumulated knowledge of the properties and uses of soils over the years, have all contributed to the improved information contained in this new series of reports.

This report contains a brief description of the location, environmental setting and major soil landscapes of the study area. It includes; a small scale generalized soil map, schematic keys to the soil series and detailed soil series descriptions, as well as a brief explanation and tabulation of interpretations for the soils mapped in the report area. Soil suitability interpretations include both dryland (Agricultural Capability) and irrigated agriculture ratings, as well as selected engineering and recreational uses.

Additional site specific data may be obtained upon request. Soil information is also available for other survey projects in selected areas throughout Manitoba. In addition, soil water table levels, soil temperatures, soil salinity and soil erosion data is available for selected sites and areas.

Inquiries or requests for information can be made to:

Canada-Manitoba Soil Survey
Rm. 362 Ellis Bldg.,
University of Manitoba
Winnipeg, Manitoba
R3T 2N2
Phone: 474-6115:474-6118

ACKNOWLEDGEMENTS

This study was conducted as a joint project of the Canada Department of Agriculture, Manitoba Department of Agriculture and the Soil Science Department, University of Manitoba.

The soils were mapped by: M. Langman, I.G. Podolsky, E. St. Jacques and D. Swidinsky.

Laboratory analysis were provided by R. Mirza, K.C. Yeung and J. Madden under the direction of P. Haluschak.

Mapping bases were provided by the Land Resource Research Centre, Ottawa.

Map compilation and digitization in preparation for publication and addition to a cartographic file was provided by J. Griffiths, R. DePape and M. Brown.

Manuscript review and soil correlation were provided by the pedologists of the Canada-Manitoba Soil Survey.

Final typing of the report manuscript was provided by D. Sandberg.

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PART 1

GENERAL DESCRIPTION STUDY OF THE SOILS OF VICTORIA

1.1 HISTORY OF SOIL SURVEY IN THE STUDY AREA

This report contains information of a detailed (1:20,000 scale) soil survey of the Rural Municipality of Victoria in south-central Manitoba (Figure 1). The municipality covers approximately 675 km² in Townships 7 to 9 and Ranges 10 to 12 west. This area was originally surveyed for soil resources in 1936-1937, and was subsequently published at a scale of 1:126,720 in two reconnaissance soil reports:

1. Report of the Reconnaissance Soil Survey of South-Central Manitoba, Report No. 4, (Ellis and Shafer, 1943), and

2. Report of the Reconnaissance Soil Survey of Carberry Map Sheet Area, Report No. 7 (Ehrlich et. al., 1957).

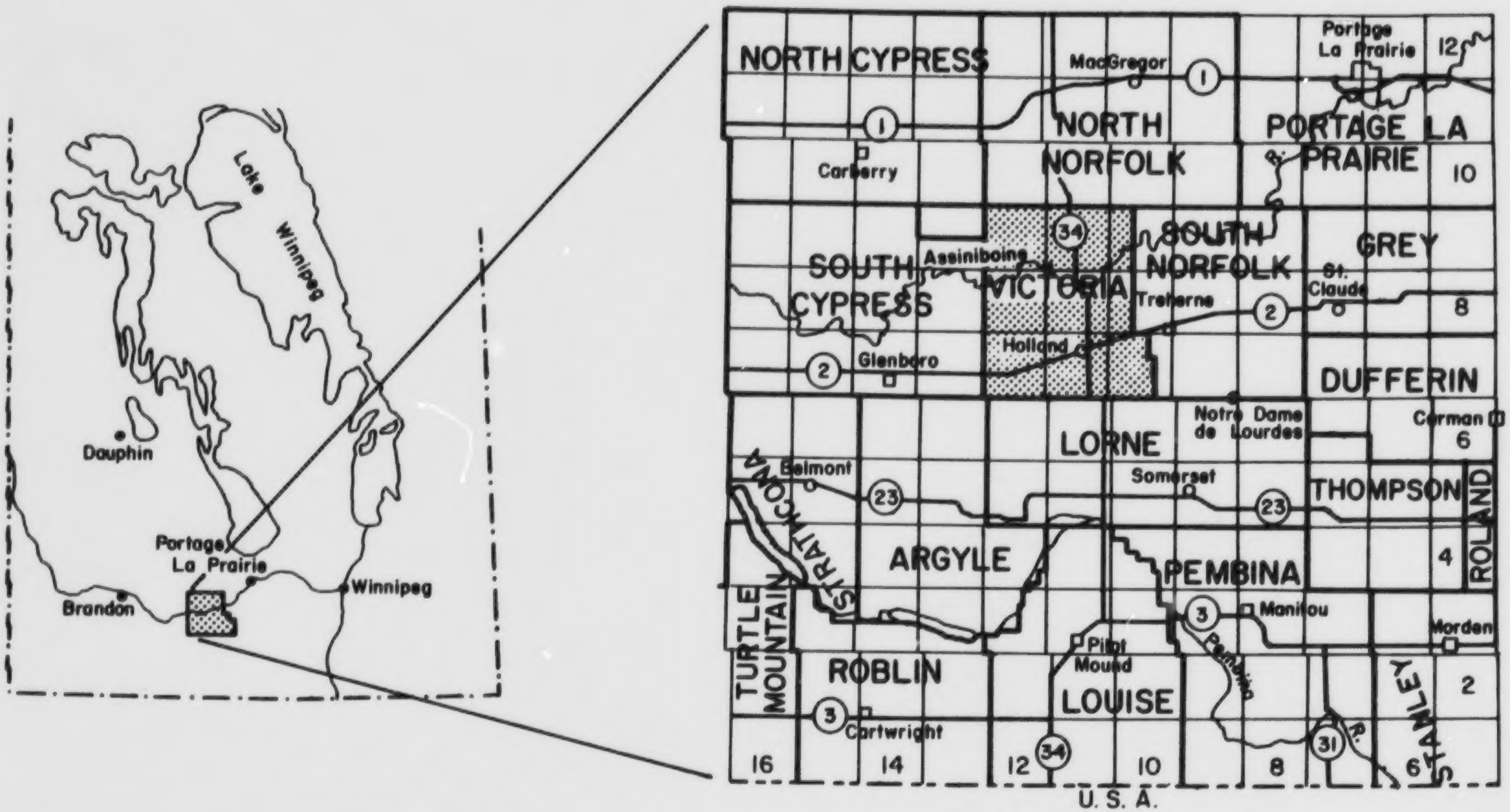
Western portions of the R.M. of Victoria which occur within the boundaries of the Spruce Woods Provincial Park were re-surveyed in 1981. A semi-detailed (1:40,000 scale), preliminary soil map of the re-survey was published in 1983-1984:

> Soils of the Spruce Woods
> Provincial Park
> Canada-Manitoba Soil Survey,
> Report No. D43, 1983.

Soil map delineations and soil information from this study have been incorporated into the current re-survey of Victoria.

1.2 SOIL SURVEY METHODS

Field investigations for the current project were carried out in 1985-1986. Survey data was compiled on 1:15,840 scale aerial photographs which were subsequently published on 1:20,000 scale photo mosaic bases. South of the Assiniboine River and east of the Cypress River where road access is good and most of the land area is cultivated, soils were inspected at regular intervals. This resulted in one soil inspection for approximately every 30 hectares of land. Land north and west of the Assiniboine and Cypress Rivers which is dominantly forested was inspected at sporadic and widely spaced intervals due to limited and irregular access.


Lake Winnipeg
Dauphin
Portage La Prairie
Brandon
Winnipeg
NORTH CYPRESS
MacGregor
Portage La Prairie
12
1
NORTH NORFOLK
PORTAGE LA PRAIRIE
Carberry
10
34
SOUTH NORFOLK
GREY
SOUTH CYPRESS
Assiniboine
VICTORIA
Treherne
St. Claude
2
8
Holland
Glenboro
DUFFERIN
LORNE
Notre Dame de Lourdes
Carman
6
Belmont
23
Somerset
THOMPSON
STRATHCONA
ARGYLE
PEMBINA
4
ROLAND
TURTLE MOUNTAIN
3
Manitou
Morden
Pilot Mound
ROBLIN
LOUISE
Pembina
STANLEY
31
R.
Cartwright
16
14
12
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8
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U. S. A.

Figure 1: Location of the Rural Municipality of Victoria.

1.3 GENERAL DESCRIPTION OF STUDY AREA

The Rural Municipality of Victoria is situated on the eastern limits of the Saskatchewan Plain physiographic division[1]. Upland parts of this division are found in the southeast (Pembina Hills Upland) and the southwest (Tiger Hills Upland) of the Municipality (Figure 2). The remainder of Victoria lies within the Assiniboine River Plain section. This area is subdivided into the Upper Assiniboine Delta in the north and the Brandon Lake Plain subsection in the central portion of the Municipality. The physiographic features of these areas combine with the effects of vegetation, climate and soil to produce distinct ecoclimatic regions in the study area.

Victoria occurs mostly within subregion 2 of the Grassland transition ecoclimatic region[2] where aspen parkland and grassland vegetation converge (Figure 3). The extreme southeast of the Municipality at higher elevations, lies in subregion 2 of the Low Boreal, Subhumid ecoclimatic region. This is the southern most and warmest portion of the Boreal Ecoprovince in Manitoba and is comprised of a near continuous forest stand of hard-woods and mixed woods.

Local variations in soils, relief and landuse in Victoria permit the creation of five soil-landscape relationships:

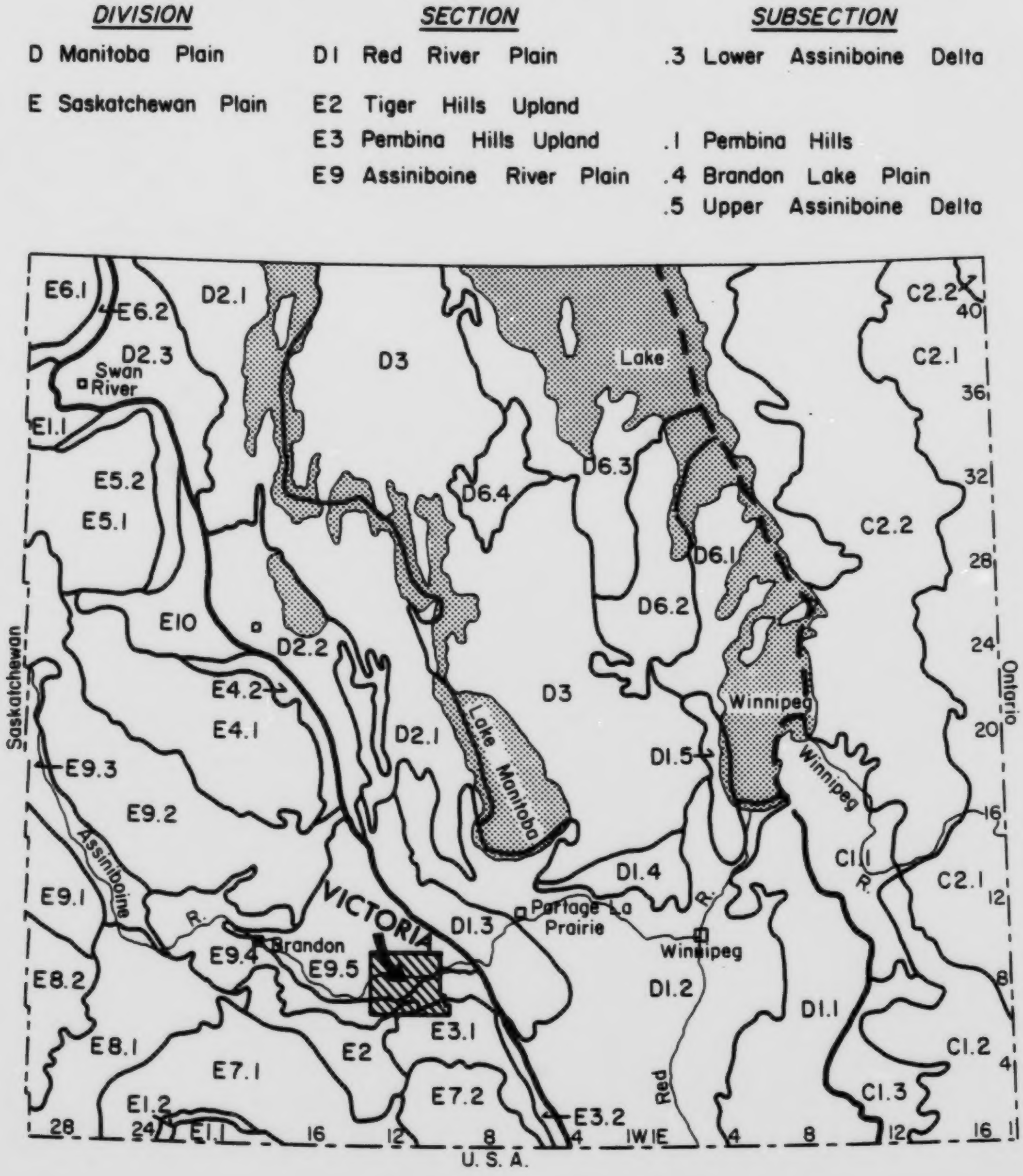
A. A forested lacustrine sand area dominates north of the Assiniboine River and west of the Cypress River. These wind-modified sands occur approximately at 375 m a.s.l. with a local relief in duned landscapes of 5 to 10 m. The sand deposits are highly permeable and drain rapidly but drainage can be restricted in low lying areas. Groundwater in this area generally flows toward the Assiniboine and Cypress Rivers and exits the Municipality to the east. Regosol[3] soils predominate on steeper slopes where soil development is minimal and wind erosion is a hazard. Map delineations of Shilox and similar sandy soil types are common in this area (Figure 4). Poorly drained depressions associated with the dunes, contain mostly Humic Gleysol or Terric Mesisol soils. Map units containing Perillo and similar organic soils, or peaty phases of sandy mineral soils are mapped in these depressions. Soils of the area are used predominantly for natural grazing, recreational activities and wild life habitat. Approximately 8 900 ha of the forested sands in the western portion of the Municipality have been incorporated into the Spruce Woods Provincial Park. Dark Gray Chernozemic soils occur where sufficient soil development has taken place.

---

[1] Canada-Manitoba Soil Survey. 1980. Physiographic Regions of Manitoba. Ellis Bldg., University of Manitoba, Winnipeg. Revised. Unpublished Report.

[2] Canada-Manitoba Soil Survey. 1979. Ecological Regions and Subregions in Manitoba. Ellis Bldg., University of Manitoba. Revised. Unpublished Report.

[3] Agriculture Canada. 1987. The Canadian System of Soil Classification. Research Banch. Agriculture Canada. Publ. No. 1646, 2nd Edition.


DIVISION
SECTION
SUBSECTION
D Manitoba Plain
D1 Red River Plain
.3 Lower Assiniboine Delta
E Saskatchewan Plain
E2 Tiger Hills Upland
E3 Pembina Hills Upland
.1 Pembina Hills
E9 Assiniboine River Plain
.4 Brandon Lake Plain
.5 Upper Assiniboine Delta
VICTORIA
Lake Winnipeg
Lake Manitoba
Swan River
Brandon
Portage La Prairie
Winnipeg
Assiniboine R.
Red R.
Winnipeg R.
Saskatchewan
Ontario
U. S. A.
E6.1
E6.2
D2.1
D2.3
D3
E1.1
E5.2
E5.1
D6.4
D6.3
D6.1
D6.2
E10
D2.2
E4.2
E4.1
D2.1
D3
D1.5
E9.3
E9.2
E9.1
D1.4
D1.3
E9.4
E9.5
E8.2
E3.1
E8.1
E7.1
E2
E7.2
E3.2
E1.2
E1.1
D1.2
D1.1
C2.2
C2.1
C2.2
C1.1
C2.1
C1.2
C1.3
28
24
16
12
8
4
1W1E
4
8
12
16
1
4
8
12
16
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24
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32
36
40

Figure 2: Physiographic Regions of Victoria.

Map units of dominantly Dobbin soils with inclusions of imperfectly or poorly drained sandy soils describe areas of these soils. These areas have been mostly cleared and cultivated for crop production.

B. The Assiniboine River and its tributaries drain much of the central and southern portion of Victoria. The present-day river is underfit and meanders within an ancient channel. Dominantly loamy fluvial-lacustrine deposits are found in the channel on level terraces varying between 1 to 3 km in width at elevations of 300 and 380 m a.s.l.

High level terraces within this valley are mostly well drained while those closer to the present river level are imperfectly drained with a relatively high seasonal water table. Occasional flooding adds new sediment to the low level terraces producing soils which are dominantly Cumulic Regosols. Gervais and La Salle soils dominate map delineations on the landscape in the east of the study area. Mowbray and Assiniboine soils dominate in map delineations west of Highway 23 along the Cypress and Assiniboine Rivers (Figure 4). In areas above the threat of flooding Black Chernozemic soils are common. Janick, Croyon and Ramada map units are common in this area. Steep forested valley slopes between the level terraces contain Black and Dark Gray Chernozemic soils. Halstead soils are commonly described in map delineations on these slopes.

Level terrace soils generally have a high agricultural capability (mostly CLI class 2)[4] and support a wide variety of crops. Small deposits of sand and gravel also occur in the terraces and have been exploited as an aggregate source for road construction.

C. A flat-lying, lacustrine plain extends south of the Assiniboine River to the Pembina and Tiger Hills, and east from the Cypress River to the eastern limit of the Municipality. The plain occurs at approximately 370 m.a.s.l. and displays less than 5m of local relief. The moderately permeable loamy to fine loamy deposits common to the area are drained by a series of short, shallow tributaries into the Assiniboine and Cypress Rivers. Soils are mostly well drained, highly fertile (CLI class 1), Black Chernozems which produce a wide variety of crops including cereals, oil seeds, corn and potatoes. Map delineations in this area range from areas dominantly composed of well drained Fairland, Ramada and Stockton to imperfectly drained Prodan and Charman soils (Figure 4). Water erosion is a potential soil hazard on strongly sloping land adjacent to stream tributaries and near the Assiniboine River valley.

D. A low relief glacial meltwater channel between 1 to 1.5 km wide cuts between discontinuous till ridges south of, and approximately parallel to, Highway 2. This channel occurs at 375 m a.s.l. and has less than 5 m of local relief. Fine loamy to clayey deposits, estimated to be 1 to 5 m thick over shale bedrock, dominate in the area. Surface runoff drains slowly to the east through a series of marshes, ditches and sloughs into the Boyne River. Internal drainage is restricted by slowly permeable soils, by proximity to slowly pervious bedrock, and by a high water table. Soils are mostly Rego Humic Gleysols and are generally moderately to strongly saline. Map delineations are mostly Tadpole soils or marsh complexes. Areas of imperfect drainage at the edges of the channel are described by map delineations of Oliver and Prodan soils. Wet soil, seasonal ponding, poor soil structure and soil salinity contribute to the low agriculture potential of (CLI class 5) much of the land in the area. This soil area is used mostly for natural grazing on drier sites and for wildlife habitat in ponded areas.

---

[4] Anon. 1965. Land Capability Classification for Agriculture. Report No. 2, Canada Land Inventory. Can. Dept. of Regional Economic Expansion, Ottawa.

E. A bedrock controlled, hummocky morainic landscape occurs in the extreme southeast of the Municipality. This upland area ranges in elevation from 380 to 495 m a.s.l. with a local relief of 5 to 15 m on isolated knolls. Surface deposits are dominantly comprised of a variable thickness of loamy to fine loamy, slightly stony Lennard till[5] over shale bedrock from the Vermilion River Formation[6]. Dark Gray Chernozems dominate on these well drained, moderately permeable soils in upland areas where runoff is rapid and the water table is usually below rooting depth. Map delineations of dominantly Dezwood soils occur in this area on mixed Lennard till. Fifere soils dominate in map delineations on non-calcareous shale till. Altamont soils and its drainage associates are described in map delineations where the till is overlain by shallow lacustrine deposits (Figure 4). Humic Gleysols occur in depressional areas associated with the upland knolls. Drainage in these lows is poor and surface ponding is common. Steeply sloping uplands are mostly wooded or are cleared for native grazing. Gently sloping uplands are mostly deforested and cultivated for cereal crop production. The steep topography of the area is the main limitation (CLI class 6T and 4T) to agricultural productivity. Water erosion is also a soil hazard on steep landscapes.

1.4 GENERALIZED SOILS MAP (1:125,000 SCALE)

The distribution of major soil groups in the Rural Municipality of Victoria is shown in Figure 4. Soils have been grouped together based on similarities of parent material, soil drainage and soil profile development. The soil name assigned to each map delineation is derived from the soil series believed to be dominant within the map delineation based on

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[5] Manitoba Energy and Mines. 1984. Surficial Geology and Aggregate Resource Inventory of the Rural Municipality of Victoria. Aggregate Rpt. No. AR84-4. Underwood McLellan Ltd. Wpg. Manitoba.

[6] Klassen, R.W. 1975. Quaternary Geology and Geomorphology of Assiniboine and Qu'Appelle Valleys of Man. and Sask. Geological Survey of Can., No. 228.

Ecoclimatic Region[1]	Subregion[2]	Dominant Soils	Soil Climate		Vegetation Zone
			Temperature Class	Moisture Subclass	
GRASSLAND TRANSITION	GT 1, 2, 3, 4	Chernozemic Black, Gleysols	Boreal, cool to moderately cool	Subhumid	Grassland and Aspen Parkland
LOW BOREAL subhumid	LBs 1, 2	Chernozemic Dark Gray Brunisolic Organic	Cryoboreal, moderately cold	Subhumid	Grassland-Forest Transition
LOW BOREAL, subhumid transition	LBst	Brunisols Luvisols Chernozemic Dark Gray, Gleysols Organic	Cryoboreal, moderately cold	Humid to subhumid	Mixed Deciduous-Coniferous Forest
LOW BOREAL, subhumid transition		Brunisols Luvisols Chernozemic Dark Gray, Gleysols, Organic	Cryoboreal, moderately cold	Humid to subhumid	Mixed Deciduous-Coniferous Forest
MID BOREAL, subhumid	MBs 1, 2, 3	Luvisolic, Brunisols Gleysols Organic	Cryoboreal, moderately cold	Subhumid to humid	Mixed Deciduous-Coniferous Forest

[1] Ecoclimatic Regions of Manitoba. Canda-Manitoba Soil Survey, 1985. Unpublished data, revised, 1985.

[2] Subregions reflect climatic influence which is expressed in local soil and vegetation relations and which affect land use, management and potential biomass production.

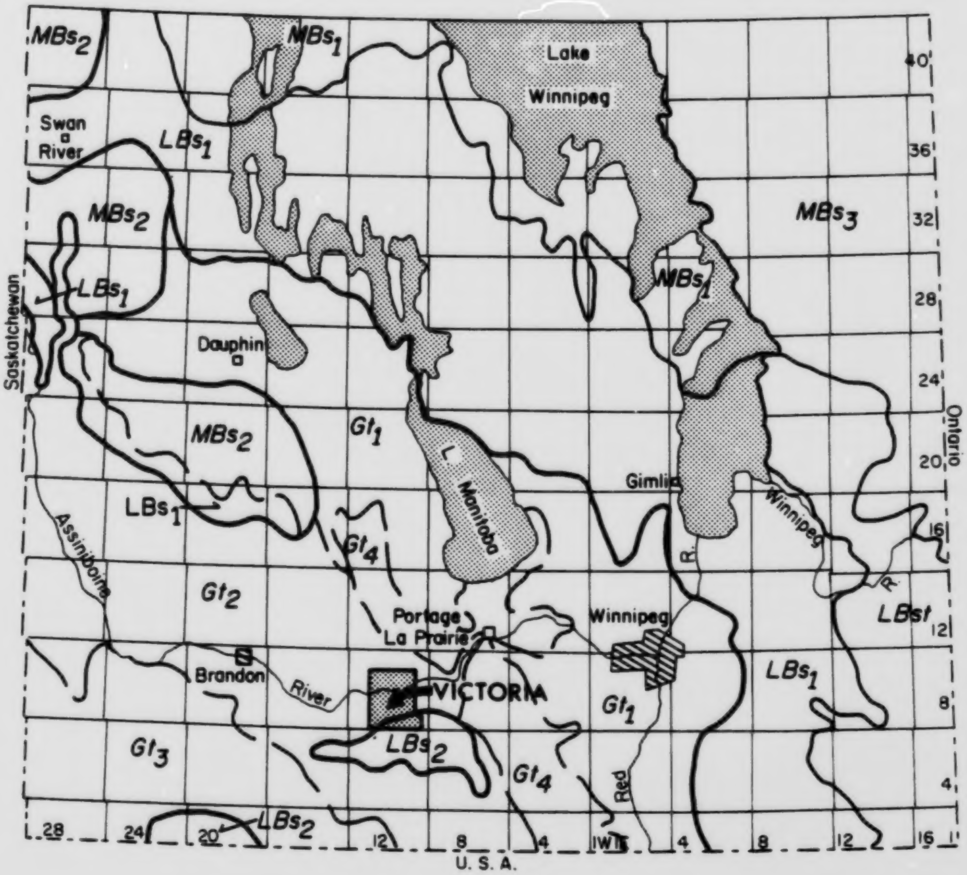
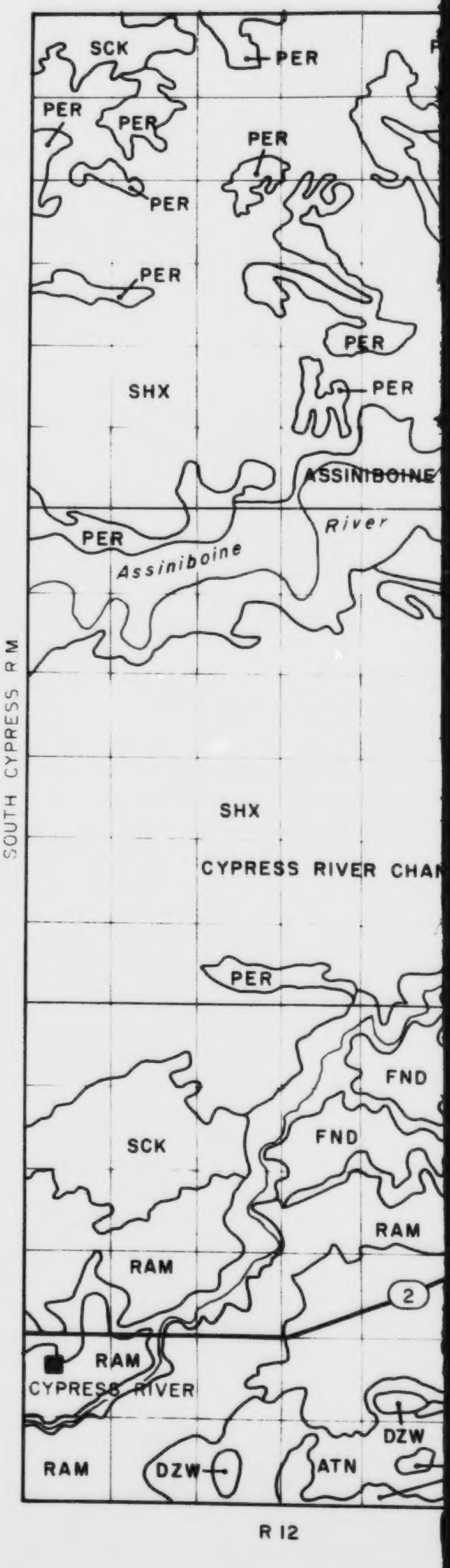

MBs2
MBs1
Lake Winnipeg
40
Swan River
LBs1
36
MBs2
MBs3
32
LBs1
MBs1
28
Saskatchewan
Dauphin
24
Ontario
MBs2
Gt1
L. Manitoba
20
Gimli
LBs1
Winnipeg R.
16
Gt4
Assiniboine
Gt2
Portage La Prairie
Winnipeg
LBst
12
Brandon
River
VICTORIA
Gt1
LBs1
8
Gt3
LBs2
Gt4
Red R.
4
28
24
20
LBs2
12
8
4
IWM
4
8
12
16
1
U. S. A.

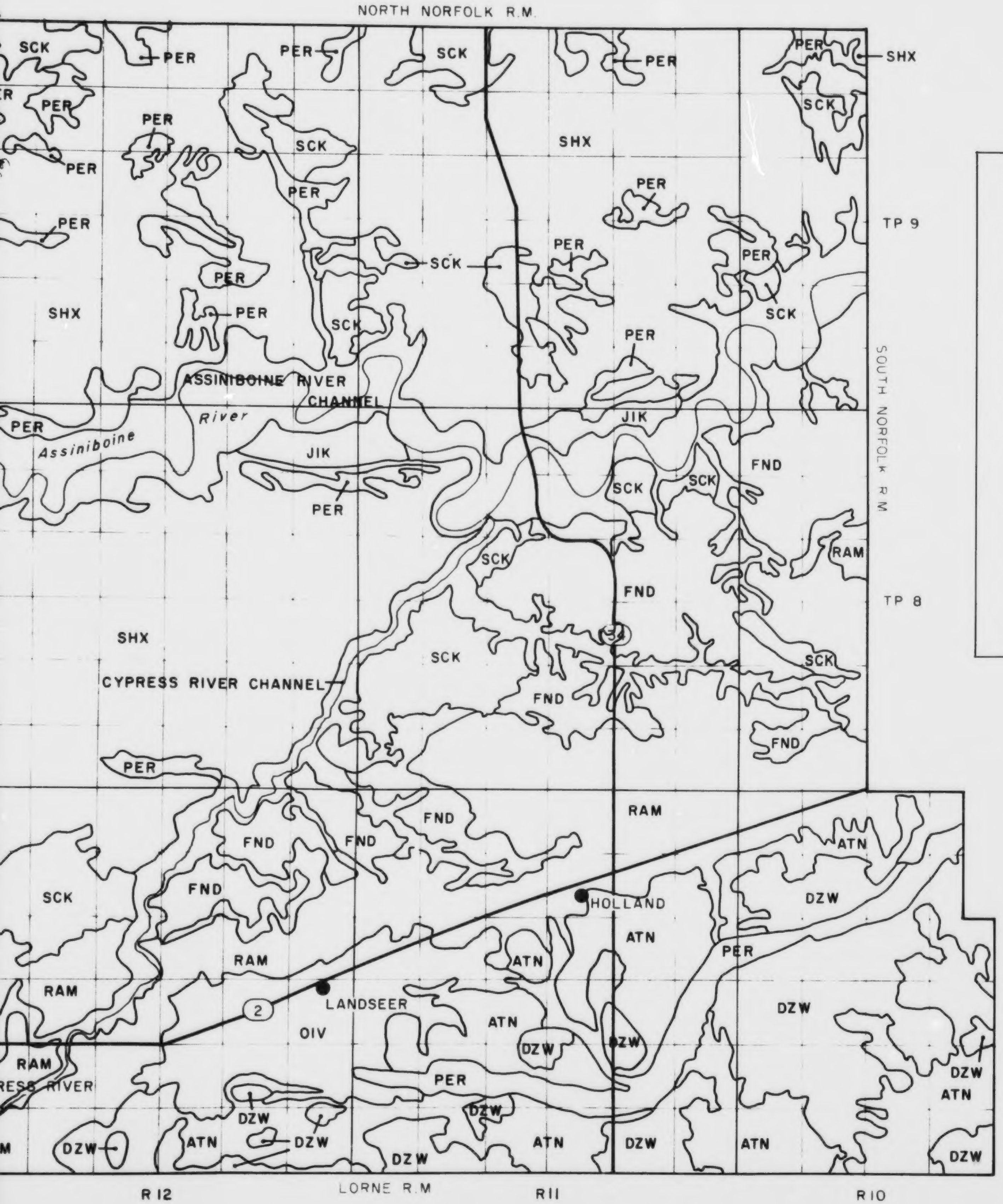
Figure 3: Ecoclimatic Regions and Subregions of Victoria.

information from detailed soil maps of the area. Soil phases, minor components of map delineations and soil inclusions are not recognized in this generalized soils map. However, the map provides an overview of the soil distribution in the map area and for this reason is useful for broad-scale planning and for identifying regional landuse potential or limitations.

1.5 SOILS OF THE R.M. OF VICTORIA

The soil series encountered in the Rural Municipality of Victoria are listed according to parent material, drainage and taxonomic subgroup in Table 1. Soils are broadly grouped into soil climate zones. Soils developed on similar parent materials are grouped within these zones and then soil series are identified based on type and degree of soil development. Table 2 provides an abbreviated reference key illustrating the relationship among soil series, soil drainage, soil taxonomy and parent material. The detailed description of each soil series mapped in Victoria follows after Table 2. Soils are listed in alphabetical order and include descriptions of the genetic soil profile, textural limits, parent material, soil drainage, topographic location and common land use.


SCK
PER
PER
PER
PER
PER
PER
SHX
PER
PER
ASSINIBOINE
River
PER
Assiniboine
SOUTH CYPRESS R.M.
SHX
CYPRESS RIVER CHAN
PER
FND
FND
SCK
RAM
RAM
2
RAM
CYPRESS RIVER
DZW
RAM
DZW
ATN
R 12



Map Symbol	Soil Materials	Predominant Soil Series	Comments
SHX	Eolian sands	Shilox, Onahan	Dominantly Regosolic soils occurring on duned, forested landscapes. Extremely suseptible to wind erosion.
SCK	Lacustrine sands and loamy sands	Stockton,Dobbin, Lavenham	Dominantly Dark Gray Chernozems in the north and Black Chernozems in the south of the map area. These soils occur mostly on gently undulating landscapes adjacent to eolian sand areas.
FND	Lacustrine loams and very fine sands	Fairland, Halstead, Torcan, Bone	Dominantly Dark Gray and Black Chernozems on level to gently undulating lacustrine lands. Also occurring on strongly dissected lands adjacent to the Cypress and Assiniboine Rivers.
RAM	Lacustrine clay loams and silty clay loams	Ramada, Firdale Danlin, Tadpole	Dominantly Black Chernozems occurring on Level to gently undulating, very productive agricultural lands.
ATN	Thin lacustrine veneers over till, modified till or sand and gravel	Altamont, Knudson, Jaymar, Croyon, Vandal	Dominantly Dark Gray Chernozems occurring on undulating to hummocky landscapes in the south of the study area.
DZW	Glacial till loams and clay loams derived from mixed or shale till	Dezwood, Fifere, Nayler, Pembina, Hilton	Dominantly Dark Gray Chernozems occurring on strongly undulating and hummocky landscapes in the south of the study area. These soils are very suseptible to water erosion and should not be summer fallowed.
JIK	Lacustrine clays	Janick	Dominantly Black Chernozems occurring on level terraces of the Assiniboine River.
OIV	Saline, lacustrine clays	Oliver, Landseer, Tadpole saline phase	Dominantly Solonetzic Black Chernozems and Gleysols on a level landscape. These soils are strongly influenced by saline ground water near the soil surface.
PER	Variable thicknesses or organic soils over mineral soils	Perillo, Xavier, Marsh Complex, peaty phase of mineral soils	Dominantly very poorly drained organic Mesisol soils and organic phases of mineral soils. These soils are mostly under native hydrophtic vegetation.

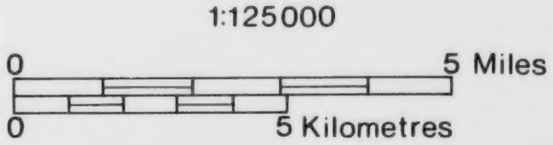


FIGURE 4
GENERALIZED SOIL MAP OF
VICTORIA R.M.

TABLE 1

General Soils Legend-Key to the Soils of the Rural Municipality of Victoria

Soils noted with an asterisk occur in Ecoclimatic Subregions (Gt_4 and Gt_4)
The remaining soils occur in Subregion (LBs_2 and Gt_2)

1. Soils developed on deep (>100 cm), fine loamy and coarse loamy (L, CL, SiCL), moderately to strongly calcareous mixed till deposits	
a) Well to moderately well drained	
• Darlingford Series (Orthic Black)	DGF
• Dezwood Series (Orthic Dark Gray)	DZW
• Pembina Series (Orthic Dark Gray Luvisol)	PBI
b) Imperfectly drained	
• Ferris Series (Gleyed Rego Black)	FRS
• Ollneck Series (Gleyed Dark Gray Luvisol)	OLK
• Nikkel Series (Gleyed Black)	NKK
c) Poorly drained	
• Cazlake Series (Rego Humic Gleysol)	CZK
• Horose Series (Rego Humic Gleysol)	HOS
2. Soils developed on deep (>100 cm), fine loamy and fine silty (CL, L, SiL), weakly calcareous to neutral, shale till deposits.	
a) Well to moderately well drained	
• Fifere Series (Orthic Dark Gray)	FFR
• Nayler Series (Orthic Dark Gray Luvisol)	NYO
3. Soils developed on deep (>100 cm) fine loamy (L, CL, SiCL), strongly to extremely calcareous till of limestone and granitic origin.	
a) Well to moderately well drained	
• Hilton Series (Orthic Black)	HIT

  - Tiger Hills Series (Orthic Dark Gray) TGL

- b) Poorly drained
  - Hickson Series (Rego Humic Gleysol) HKS

4. Soils developed on fine loamy (L, CL, SiCL) moderately to strongly calcareous lacustrine deposits overlying moderately to strongly calcareous fine loamy (L, CL) mixed till at 25 to 100 cm depth.

   - a) Well to moderately well drained
     - Knudson Series (Orthic Black) KUD
     - Altamont Series (Orthic Dark Gray) ATN
     - Kingsley Series (Orthic Dark Gray Luvisol) KIS
   - b) Imperfectly drained
     - Joyale Series (Gleyed Rego Black) JYL
     - Tellier Series (Gleyed Dark Gray) TLI
     - Ullrich Series (Gleyed Black) ULH
   - c) Poorly drained
     - Guerra Series (Rego Humic Gleysol) GRR
     - Narish Series (Rego Humic Gleysol) NSH

5. Soils developed on a sequence of calcareous sediments consisting of a thin mantle (25-60cm) of moderately to strongly calcareous loamy sediments (L, SiL, SiCL, CL) over thin (10-40 cm) medium sand to gravelly strata, over very strongly calcareous loamy (L, SiL) glacial till. Strongly calcareous loam to clay loam glacial till of shale, limestone and granitic origin usually occurs within a two meter depth.

   - a) Well to moderately well drained
     - Jaymar Series (Orthic Black) JAY
   - b) Imperfectly drained
     - Melland Series (Gleyed Rego Black) MXT
   - c) Poorly drained
     - Marsden Series (Rego Humic Gleysol) MDN

6. Soils developed on moderately to strongly calcareous, stratified, sandy (LS, S) and sandy skeletal (GrS, GrCS), outwash and fluvial sediments.

   a) Well to moderately well drained

• Marringhurst Series (Calcareous Black)	MRH
• Marringhurst, shale gravel variant (Calcareous Black)	MRH1
• Birkenhead Series* (Calcareous Black)	BKA
• Dorset Series (Orthic Black)	DOT
• Leary Series (Orthic Dark Gray)	LRY
• Leary, coarse-loamy substrate (Orthic Dark Gray)	LRY1

7. Soils developed on thin (25-90 cm), moderately to strongly calcareous, loamy (L, SiL, SiCL, CL) sediments overlying moderately to strongly calcareous, sandy (S, LFS, FS) and sandy skeletal (LS, GrS) sediments.

   a) Well to moderately well drained

• Croyon Series (Orthic Black)	CYN
• Vandal Series (Orthic Dark Gray)	VDL
• Vandal, shale gravel variant (Orthic Dark Gray)	VDL1

   b) Imperfectly drained

• Vartel Series (Gleyed Dark Gray)	VTL
• Vartel, shale gravel variant (Gleyed Dark Gray)	VTL1
• Capell Series (Gleyed Rego Black)	CXT
• Capell, shale gravel variant (Gleyed Rego Black)	CXT1

   c) Poorly drained

• Carvey Series (Rego Humic Gleysol)	CAV

8. Soils developed on weakly to moderately calcareous, sandy (FS, LFS, LS), lacustrine and fluvial sediments.

   a) Well to moderately well drained

• Arizona Series (Orthic Regosol)	AIZ

- Cactus Series (Rego Black) CCS
- Dobbin Series (Orthic Dark Gray) DOB

b) Imperfectly drained

- Lavenham Series (Gleyed Black) LVH
- Hummerston Series (Gleyed Rego Black) HMO

c) Poorly drained

- Sewell Series (Rego Humic Gleysol) SEE

9. Soils developed on weakly to noncalcareous, sandy (FS, LFS, LS) dominantly eolian sediments.

a) Well to moderately well drained

- Shilox Series (Orthic Regosol) SHX

b) Imperfectly drained

- Onahan Series (Gleyed Regosol) ONH

c) Poorly drained

- Mockry Series (Rego Humic Gleysol) MKY

10. Soils developed on moderately to strongly calcareous, coarse loamy (VFS, LVFS, FSL), lacustrine and fluvial sediments.

a) Well to moderately well drained

- Hochfeld Series* (Orthic Black) HHF

b) Imperfectly drained

- Gateside Series (Gleyed Black) GTD
- Bone Series (Gleyed Dark Gray) BNE

c) Poorly drained

- Poolex Series (Rego Humic Gleysol) POX

11. Soils developed on strongly to very strongly calcareous, loamy (VFSL, L, SiL), lacustrine sediments.

a) Well to moderately well drained

- Fairland Series (Orthic Black) FND

    - Durnan Series (Rego Black) DRN
    - Halstead Series (Orthic Dark Gray) HAT

  b) Imperfectly drained

    - Torcan Series (Gleyed Black) TOC

  c) Poorly drained

    - Vordas Series (Rego Humic Gleysol) VDS

12. Soils developed on strongly to very strongly calcareous fine loamy (CL, SiCL) lacustrine sediments.

  a) Well to moderately well drained

    - Ramada Series (Orthic Black) RAM
    - Rempel Series (Calcareous Black) RMP
    - Carroll Series (Rego Black) CXF
    - Firdale Series (Orthic Dark Gray) FIR

  b) Imperfectly drained

    - Charman Series (Gleyed Black) CXV
    - Prodan Series (Gleyed Rego Black) PDA
    - Danlin Series (Gleyed Dark Gray) DLN

  c) Poorly drained

    - Tadpole Series (Rego Humic Gleysol) TDP

13. Soils developed on a thin mantle (25 to 75 cm) of moderately to strongly calcareous clay loam to sandy clay loam sediments grading to moderately calcareous sandy (FS, LFS, LS) deposits.

  a) Well drained

    - Wellwood Series (Orthic Black) WWD

  b) Imperfectly drained

    - Crookdale Series (Gleyed Rego Black) CKD
    - Oberon Series (Gleyed Black) OBR

  c) Poorly drained

    - Sutton Series (Rego Humic Gleysol) SXP

14. Soils developed on a thin mantle of moderately to strongly calcareous loamy textured (VFSL, L, SiL) sediments grading to moderately calcareous sandy textured (FS, LFS, LS) deposits.

    a) Well drained

        - Glenboro Series (Orthic Black) GBO

    b) Imperfectly drained

        - Petrel Series (Gleyed Black) PTR

        - Grover Series (Gleyed Rego Black) GRO

15. Soils developed on moderately to strongly calcareous silty clay to clay lacustrine deposits.

    a) Well to moderately well drained

        - Janick Series (Orthic Black) JIK

    b) Imperfectly drained

        - Harding Series (Gleyed Black) HRG

        - Sigmund Series (Gleyed Rego Black) SGO

    c) Poorly drained

        - Lowton Series (Rego Humic Gleysol) LWN

16. Soils developed on clayey (SiC, C), somewhat stratified, moderately to strongly calcareous fluvial and lacustrine sediments.

    a) Moderately well drained

        - Winkler Series* (Orthic Black) WIK

17. Soils developed on a thin mantle of moderately to strongly calcareous silty clay to clay textured sediments grading to moderately calcareous loamy to sandy, variably saline sediments.

    a) Imperfectly drained

        - Oliver Series (Gleyed Black Solonetz) OIV

    b) Poorly drained

        - Landseer Series (Rego Humic Gleysol) LSR

18. Soils developed on coarse to fine loamy (VFSL, L, CL, SiCL), moderately to strongly calcareous, stratified, recent alluvial sediments.

    a) Well drained

    - Mowbray Series (Cumulic Regosol) MOW
    - La Salle Series* (Cumulic Regosol) LSL

    b) Imperfectly drained

    - Levine Series (Gleyed Cumulic Regosol) LEI
    - Gervais Series* (Gleyed Cumulic Regosol) GVS
    - Poplar Point* (Gleyed Cumulic Regosol) PPR

    c) Poorly drained

    - Basker Series (Rego Humic Gleysol) BKR
    - Willowbend Series* (Rego Humic Gleysol) WWB

19. Soils developed on moderately to strongly calcareous, stratified, dominantly clayey recent alluvial deposits of SiC, C, with stratum of SiCL, CL textures.

    a) Imperfectly drained

    - Assiniboine Series (Gleyed Cumulic Regosol) ASB

    b) Poorly drained

    - Kerran Series (Rego Humic Gleysol) KRN

20. Organic soils developed on thin (40-160 cm), moderately decomposed, mesic fen peat overlying stratified, sandy (L, LFS, FS) to loamy (SiL, L, CL, SiCL) sediments.

    a) Poorly to very poorly drained

    - Perillo Series (Terric Mesisol) PER

21. Organic soils developed on deep (greater than 160 cm), moderately decomposed, mesic fen peat.

    a) Poorly to very poorly drained

    - Xavier Series (Typic Mesisol) XVI

22. Soils developed on sandy (S, FS, LFS) to loamy (VFSL, L, SiL), moderately calcareous sediments on moderately to steeply sloping valley walls along the Assiniboine River and its tributaries.

- Shellmouth Complex SEU

23. Soils developed on a complex arrangement of undifferentiated materials with a range of drainage, erosion, texture, topography and soil development characteristics adjacent to and including drainage channels.

    - Eroded Slopes Complex ERX

24. Soils developed on a complex arrangement of poorly and very poorly drained, undifferentiated organic soils, mineral soils and open water in wetland areas.

    - Marsh Complex MHC

Table 2 Key to the Soils of Ecoclima

Soil Drainage	Taxanomic Subgroup	Lo Ca Mi
Well to Moderately Well Drained	Orthic Regosol	
	Cumulic Regosol	
	Orthic Black	Da
	Calcareous Black	
	Rego Black	He
	Orthic Dark Gray	De
	Orthic Dark Gray Luvisol	Pe
Imperfectly Drained	Gleyed Black Solonetz	
	Gleyed Cumulic Regosol	
	Gleyed Rego Black	Fe
	Gleyed Black	Ni
	Gleyed Dark Gray	
	Gleyed Dark Gray Luvisol	Ol
Poorly Drained	Rego Humic Gleysol	Ho
	Terric Mesisol	
	Typic Mesisol	

** Guerra Series associated with Blac

Narish Series associated with Dark

Key to the Soils of Ecoclimatic Subregions LBs_2 and Gt_2 in the Rural Municipality of Victoria According to Drainage, Subgroup and Parent Material

		Dominantly Till			Dominantly Lacustrine Veneers		Dominantly Lacustrine Loams and Clays			
e	Taxonomic Subgroup	Loamy Calcareous Mixed Till	Loamy Non-Calcareous Shale Till	Loamy Extremely-Calcareous Mixed Till	Fine Loamy Lacustrine over Loamy Calcareous Mixed or Shale Till	Loamy Lacustrine over Sand and Gravel over Mixed Till	Sandy Skeletal	Loamy over Sandy Skeletal	Sandy	Sandy (Eolian)
ely	Orthic Regosol								Arizona (AIZ)	Shilox (SHX)
	Cumulic Regosol									
	Orthic Black	Darlingford (DGF)		Hilton (HIT)	Knudson (KUD)	Jaymar (JAY)	Dorset (DOT)	Croyon (CYN)		
	Calcareous Black						Marringhurst (MRH), Birkenhead (BKA)*			
	Rego Black	Hebbot (HEB)							Cactus (CCS)	
	Orthic Dark Gray	Dezwood (DZW)	Fifere (FFR)	Tiger Hills (TGL)	Altamont (ATN)		Leary (LRY)	Vandal (VDL)	Dobbin (DOB)	
	Orthic Dark Gray Luvisol	Pembina (PBI)	Nayler (NYO)		Kingsley (KIS)					
tly	Gleyed Black Solonetz									
	Gleyed Cumulic Regosol									Onahan (ONH)
	Gleyed Rego Black	Ferris (FRS)			Joyale (JYL)	Melland (MXT)		Capell (CXT)	Hummerston(HMO)	
	Gleyed Black	Nikkel (NKK)			Ullrich (ULH)				Lavenham (LVH)	
	Gleyed Dark Gray				Tellier (TLI)			Vartel (VTL)		
	Gleyed Dark Gray Luvisol	Ollneck (OLK)								
	Rego Humic Gleysol	Horose (HOS)		Hickson (HKS)	Guerra (GRR)** Narish (NSH)**	Marsden (MDN)		Carvey (CAV)	Sewell (SEE)	Mockry (MKY)
	Terric Mesisol									
	Typic Mesisol									

rra Series associated with Black Chernozems and

ish Series associated with Dark Gray Chernozems

* These soils occur in the Grassland transition Ecoclimatic Region (Subregions 1 and 4)

Table 2 continued

		Dominantly Fluvial Lacustrine Sands and Gravels								Alluvial Loams and C
Soil Drainage	Taxanomic Subgroup	Coarse Loamy	Loamy	Fine Loamy	Fine Loamy over Sand	Coarse Loamy over Sandy	Clayey	Clayey (stratified)	Clayey over Coarse Loamy to Sandy	Coarse to
Well to Moderately Well Drained	Orthic Regosol Cumulic Regosol Orthic Black Calcareous Black Rego Black Orthic Dark Gray Orthic Dark Gray Luvisol	Hochfeld (HHF)*	Fairland (FND) Durnan (DRN) Halstead (HAT)	Ramada (RAM) Rempel (RMP) Carroll (CXF) Firdale (FIR)	Wellwood (WWD)	Glenboro (GBO)	Janick (JIK)	Winkler (WIK)*		Mowbray (MOW), La Salle
Imperfectly Drained	Gleyed Black Solonetz Gleyed Cumulic Regosol Gleyed Rego Black Gleyed Black Gleyed Dark Gray Gleyed Dark Gray Luvisol	Gateside (GTD) Bone (BNE)	Taggart (TGR) Torcan (TOC)	Prodan (PDA) Charman (CXV) Danlin (DLN)	Crookdale (CKD) Oberon (OBR)	Grover (GRO) Petrel (PTR)	Sigmund (SGO) Harding (HRG)		Oliver (OIV)	Levine (LEI), Gervais (G
Poorly Drained	Rego Humic Gleysol Terric Mesisol Typic Mesisol	Poolex (POX)	Vordas (VOS)	Tadpole (TDP)	Sutton (SXP)		Lowton (LWN)		Landseer (LSR)	Basker (BKR), Willowbend

** Guerra Series associated with Black Chernozems and Narish Series associated with Dark Gray Chernozems

* These soils occur in the Grassland transition Ecoclimatic Region (Subregions 1 and 4)

	Alluvial Loams and Clays		
Sandy	Coarse to Fine Loamy	Organic	Undifferentiated Units
	Mowbray (MOW), La Salle (LSL)*		Eroded Slopes Complex (ERX)
			Shellmouth Complex (SEU)
	Levine (LEI), Gervais (GVS)*, Poplar Point (PPR)* Assiniboine (ASB)		
	Basker (BKR), Willowbend (WWB)*, Kerran (KRN)		
		Perillo (PER) Xavier (XVI)	Marsh Complex (MHC)

Altamont Series (ATN)

The Altamont series consists of well to moderately well drained Orthic Dark Gray soil developed on a mantle (25 to 100 cm) of weakly to moderately calcareous, uniform, fine loamy (L, CL, SiCL), lacustrine sediments over moderately to strongly calcareous, deep, uniform fine loamy (L, SiL, CL) mixed till deposits. These soils occur in middle to upper slope positions of very gentle slopes on undulating landscapes and have moderate permeability moderate surface runoff and a low water table during the growing season. Altamont soils are non-eroded, non-stony and non-saline. They have high available water holding capacity, medium organic matter content, and high natural fertility. Native vegetation often includes tall prairie grasses interspersed with aspen-oak groves. The majority of these soils are currently used for grain crop production.

In a representative profile of Altamont soil the solum is approximately 60 cm thick. The profile is characterized by a dark gray Ap or Ah horizon, 5 to 15 cm thick, a dark gray Ahe or AB horizon, 10 to 30 cm thick with rinsed ped surfaces, a brown to pale brown Bm horizon, 10 to 25 cm thick a transition pale brown II BC horizon 10 to 20 cm thick and occasionally a white IICca horizon 4 to 6 cm thick. The parent material is typically pale brown, to very pale brown, strongly calcareous mixed till.

Altamont soils occur in close association with Kingsley, Knudson and Tellier soils. They are similar to Firdale soils by having Orthic Dark Gray profile development in fine loamy lacustrine deposits but differ from Firdale soils because of the substrate of calcareous regional till not present in Firdale soils. Altamont soils were previously mapped as the dominant associate of the Altamont Association in the reconnaissance soil survey of South-Central Manitoba (1943).

Arizona Series (AIZ)

The Arizona series consists of moderately well to well drained Orthic Regosol soil developed on weakly to moderately calcareous, sandy (FS, LFS,LS), lacustrine and deltaic deposits. These soils occur in upper slope and knoll positions of gentle slopes on hummocky landscapes and have rapid permeability, moderate surface runoff, and a low water table during the growing season. Arizona soils are severely wind eroded, non-stony, and non-saline. They have low available water holding capacity, low organic matter content, and low natural fertility. Native vegetation includes scrub oak, black spruce and prairie grasses. The majority of these soils are currently wooded or used for natural grassing.

In a representative profile of Arizona soil there is no solum. The profile is characterized by a gray to light gray Ah horizon, 5 to 15 cm thick, and a brown to very pale brown Ck horizon, with faint reddish brown mottles.

Arizona soils occur in close association with Cactus and Stockton soils. They are similar to Shilox soils by having a Regosolic profile in sand deposits but differ from them in having deposits of lacustrine origin while Shilox soils are eolian in origin. Arizona soils were previously mapped as eroded phases of the Stockton Association in the Carberry (1957) soil report.

Assiniboine Series (ASB)

The Assiniboine series consists of imperfectly drained Gleyed Cumulic Regosol soil developed on moderately to strongly calcareous, stratified, clayey (SiC,C) deposits. These soils occur in lower slope positions of very gentle slopes on flood plain landscapes and have moderately slow permeability, slow surface runoff, and a medium water table during the growing season. Assiniboine soils are slightly water eroded, non-stony, and non-saline. They have high available water holding capacity, medium organic matter content, and medium natural fertility. Native vegetation includes ash, elm, tall prairie and meadow grasses. The majority of these soils are currently cultivated.

In a representative profile of Assiniboine soil there is no solum. The profile is characterized by a dark gray to gray Ah horizon, 5 to 20 cm thick, and a dark gray Ck horizon, many prominent mottles. The parent material is typically stratified and may contain dark strata representing former surfaces.

Assiniboine soils are similar to Levine soils by having a Gleyed Cumulic Regosol profile but differ from them in having finer textured deposits. These soils were previously mapped as inclusions of the Assiniboine Complex in the Carberry (1957) soil report.

Basker Series (BKR)

The Basker series consists of poorly to very poorly drained Rego Humic Gleysol soil developed on moderately to strongly calcareous, stratified, loamy (FSL,VFSL,L,SiL,SiCL), recent alluvial deposits. These soils occur in depressional positions of nearly level slopes on flood plain landscapes and have slow permeability, very slow surface runoff, and a high water table during the growing season. Basker soils are slightly water eroded, non-stony, and occasionally slightly saline. They have a high available water holding capacity, medium organic matter content, and low natural fertility. Native vegetation includes sedges, rushes and willows. The majority of these soils are currently in native vegetation because they are subject to flooding and saturated conditions in the spring.

In a representative profile of Basker soil there is no soil solum. The profile is characterized by light grayish brown Ahk horizon, 5 to 20 cm thick, with iron stains, and a stratified, olive brown Ckg horizon, with prominent iron mottles in the sandy strata. A typical profile also contains thin organic layers indicating former surfaces.

Basker soils occur in close association with Levine soils. They are similar to Kerran soils by having a poorly drained profile developed in recent alluvium but differ from them in having mostly loam rather than clay textures. Basker soils were previously mapped as Meadow associates of the Assiniboine Complex in the South-Central (1943) and Carberry (1957) reports.

Birkenhead Series (BKA)

The Birkenhead series is a Calcareous Black soil developed on moderately well drained, moderately to strongly calcareous, stratified sandy (LS, S, CS) and gravelly deposits. There is usually a surface mantle ranging in texture from loamy fine sand to sand over the coarser textured materials. These soils occur on gently sloping, stone-free, northwest-southeast trending beach ridges west-southeast trending beach ridges formed by glacial Lake Agassiz. Surface runoff is moderate to slow, and permeability is rapid. The native prairie grasses once associated with these soils, have been mostly replaced by cultivated grasses and legumes such as brome grass and alfalfa.

The Birkenhead soil profile has a very dark gray Ah horizon, 15 to 30 cm thick; a weakly calcareous, stratified, brown Bm horizon, 10 to 20 cm thick, and a pale brown, moderately to strongly calcareous C horizon. This soil differs from the similar Willowcrest series in having coarser textures, more rapid drainage and having a calcareous Bm horizon.

These soils are moderately severely affected by droughtiness as a result of their rapid permeability and low water-holding capacity.

Bone Series (BNE)

The Bone series consists of imperfectly drained Gleyed Dark Gray soil developed on weakly calcareous, deep, stratified, coarse loamy and coarse silty (VFS,LVFS,FSL) lacustrine deposits. These soils occur in middle positions of very gentle to gentle slopes on hummocky landscapes and have slow permeability, slow surface runoff, and a medium water table during the growing season. Bone soils are slightly eroded, non-stony, and non-saline. They have a medium available water holding capacity, medium organic matter content, and medium natural fertility. Native vegetation includes aspen, oak, shrubs and prairie grasses. The majority of these soils are currently cultivated for grain production.

In a representative profile of Bone soil the solum is approximately 90 cm thick. The profile is characterized by a dark gray to very dark gray Ah horizon, 20 to 30 cm thick, a grayish brown to brown Bmg or Bmgj horizon, 40 to 55 cm thick, a dark grayish brown Btjg or Btgj horizon, 5 to 10 cm thick, a transitional BC horizon, 5 to 10 cm thick, and a light gray, silty textured Ck horizon. A typical profile also contains layers of LVFS to SiL within a meter of the surface.

Bone soils occur in close association with Halstead, soils. They are similar to Danlin soils by having a Gleyed Dark Gray profile but differ from them in having dominantly coarser textured sediments. Bone soils were previously mapped as loamy Degraded Black associates of the Firdale Association in the Carberry (1957) soil report.

Cactus Series (CCS)

The Cactus series consists of well drained Rego Black soil developed on moderately calcareous, deep, stratified, sandy (FS,LFS,LS), lacustrine and deltaic deposits. These soils occur in upper slope and crest positions of gentle slopes on undulating duned landscapes and have moderately rapid to rapid permeability, moderate to moderately rapid surface runoff, and a low water table during the growing season. Cactus soils are highly prone to wind erosion, and are non-stony, and non-saline. They have a low available water holding capacity, medium organic matter content, and medium natural fertility. Native vegetation includes aspen, bur oak and tall prairie grasses. The majority of these soils are currently used for natural grasing

In a representative profile of Cactus soil the solum is approximately 15 cm thick. The profile is characterized by a very dark gray Ah horizon, 12 to 16 cm thick, a dark gray

AC horizon, 4 to 8 cm thick which is calcareous, a thin Cca horizon, 5 to 10 cm thick with lime accumulation and a light gray to pale brown Ck horizon.

Cactus soils occur in close association with Stockton, Arizona and Sewell soils. They are similar to Stockton soils by having a well drained profile developed in sandy deposits but differ from them in having no Bm horizon. Cactus soils were previously mapped as minor Blackearth associates of the Stockton Association in the Carberry (1957) soil report.

Capell Series (CXT)

The Capell series consists of imperfectly drained Gleyed Rego Black soil developed on a mantle (25 to 100 cm) of moderately to strongly calcareous, stratified, loamy (SiL, L, CL), lacustrine sediments over moderately to strongly calcareous, deep stratified, sandy to sandy-skeletal (GrS, GrLS), glaciofluvial deposits. These soils occur in lower slope positions of gentle to moderate slopes on hummocky landscapes and have moderate to rapid permeability, moderate surface runoff and a medium water table during the growing season. Capell soils are occasionally slightly saline. They have medium available water holding capacity, medium organic matter content, and medium natural fertility. Native vegetation often includes tall prairie and meadow grasses. The majority of these soils are currently used for grain crop production.

In a representative profile of Capell soil the solum is approximately 25 cm thick. The profile is characterized by a very dark gray to black Apk or Ahk horizon, 15 to 25 cm thick, a dark gray to gray, calcareous AC horizon, 5 to 15 cm thick, a light gray IICca horizon, 5 to 10 cm thick with secondary carbonate accumulation and a light yellowish brown IICk horizon with common, distinct iron mottles.

Capell soils occur in close association with Croyon and Carvey soils. Capell soils were previously mapped as an imperfectly drained associate of the Agassiz Association in the reconnaissance soil survey of South-Central Manitoba (1943).

Capell Series, shale gravel substrate variant (CXT-1)

The Capell Shaly Variant series is characterized by a Gleyed Rego Black (carbonated) solum on an imperfectly drained thin mantle (25 to 90 cm) of moderately to strongly calcareous loamy (L,CL,SiCL,SCL) sediments overlying moderately to strongly calcareous sand and gravel deposits intermixed with varying amounts of shaly fragments.

Capell soils occur on level to very gently sloping topography or on the lower slope positions of undulating topography. These soils have moderately slow permeability in the upper sediments and rapid permeability in the lower coarser sediments, or restricted permeability during periods of subsoil saturation due to a perched condition or high water level. In some areas, where the water contains appreciable soluble salts, a sufficient concentration of salts may occur to inhibit or retard the growth of grasses or cereals.

The solum has a very dark gray to black Ahk horizon, 15 to 24 cm thick, a dark gray to gray AC horizon, 5 to 15 cm thick. A lime accumulation horizon, 8 to 12 cm thick extends to or into the coarser materials. Brownish yellow mottles are common in the coarser sediments below.

Carroll Series (CXF)

The Carroll series is a Rego Black soil developed on moderately well to well drained, strongly to very strongly calcareous, fine loamy (CL, SiCL), lacustrine deposits. These soils occur in the Upper Assiniboine Delta and Brandon Lakes Plain on very gently sloping to undulating topography, in association with Ramada, Charman, Prodan and Tadpole soils. Surface runoff is moderately slow, and permeability is moderate. Careful management is required to reduce wind and water erosion, especially in undulating topography.

The Carroll soil profile has a very dark gray to black Ah or Ahk horizon, 15 to 20 cm thick; a dark gray ACk horizon, 10 to 15 cm thick and a Cca horizon of lime carbonate accumulation, 8 to 14 cm thick. The silty textured, pale brown Ck horizon is very erosive. This soil differs only slightly from the Ramada soil in not having a prominent Bm horizon. Carroll soils were previously mapped as the well drained associate of the Carroll Association in both the South-Central (1943) and Carberry (1957) soil reports.

Carvey Series (CAV)

The Carvey series consists of poorly drained Rego Humic Gleysol soil developed on a mantle (25 to 100 cm) of moderately to strongly calcareous, uniform, loamy (SiL, L, SL) lacustrine sediments over moderately to strongly calcareous, sandy to sandy skeletal glaciofluvial deposits. These soils occur in depressional positions of nearly level slopes on level landscapes and have moderate permeability slow surface runoff and a high water table during the growing season. Carvey soils are occasionally slightly saline. They have medium over low available water holding capacity, high organic matter content, and medium natural fertility. Native vegetation often includes sedges and meadow grasses. The majority of these soils are currently used for natural grazing.

In a representative profile of Carvey soil the solum is approximately 20 cm thick. The profile is characterized by a thin (2 to 5 cm) moderately decomposed LFH horizon a very dark gray, calcareous Ah horizon, 7 to 15 cm thick and a dark gray, calcareous, transition AC horizon, 10 to 20 cm thick, and a pale brown, calcareous IICk horizon with yellowish brown mottles. A typical profile also contains manganese concretions in the subsoil and shells at the surface.

Carvey soils occur in close association with Capell, and Croyon soils. They are similar to Tadpole soils by having a Rego Humic Gleysol profile developed in loamy lacustrine deposits, but differ from Tadpole soils by having a sandy to sandy-skeletal substrate within a meter of the mineral surface. Carvey soils were previously mapped as a Meadow associate with a loamy veneer of the Agassiz Association in the Carberry (1957) soil report.

Charman Series (CXV)

The Charman series consists of imperfectly drained Gleyed Black soil developed on strongly to very strongly calcareous, fine loamy (CL,SiCL), lacustrine deposits. In areas of seepage or discharge, soluble salts in the subsoil can be translocated near the surface in sufficient quantities to affect crop groth. These soils occur in middle positions of very gentle slopes on undulating landscapes and have moderate permeability, slow surface runoff, and a medium high water table during the growing season. Charman soils are non-eroded, non-stony, and frequently slightly saline. They have a moderately high available water holding capacity, high organic matter content, and medium natural fertility. Native vegetation includes aspen, willows, shrubs and prairie grasses. The majority of these soils are currently cultivated for grain crop production.

In a representative profile of Charman soil the solum is approximately 40 cm thick. The profile is characterized by very dark gray to black Ah horizon, 15 to 25 cm thick, a dark grayish brown Bmgj horizon, 12 to 30 cm thick, a transitional BC horizon, 5 to 8 cm thick and a pale brown, silty textured Ckgj horizon, with iron mottles and frequently gypsum crystals.

Charman soils occur in close association with Ramada, Carroll and Tadpole soils. They are similar to Prodan soils by having an imperfectly drained profile and fine loamy deposits but differ from them in having a Bmgj horizon. Charman soils were previously mapped as Black-Meadow associates of the Holland Association in the Carberry (1957) soil report.

Crookdale Series (CKD)

The Crookdale series consists of imperfectly drained Gleyed Rego Black soil developed on a mantle (25 to 100 cm) of strongly calcareous, stratified, fine loamy (CL, SiCL) lacustrine sediments over strongly calcareous, deep uniform sandy (LFS, FS, S) fluvial lacustrine deposits. These soils occur in lower slope positions of level to nearly level slopes on level landscapes and have moderate permeability moderately slow surface runoff and a medium water table during the growing season. Crookdale soils are non-eroded, non-stony and slightly saline. They have high available water holding capacity, medium organic matter content, and medium natural fertility. Native vegetation often includes tall prairie grasses. The majority of these soils are currently used for grain crop production.

In a representative profile of Crookdale soil the solum is approximately 25 cm thick. The profile is characterized by a black Ah to Ap horizon, 10 to 25 cm thick, a dark grayish brown transitional AC horizon, 10 to 20 cm thick with faint iron mottles, a white Cca horizon, 5 to 10 cm thick of lime accumulation and a light olive brown IICk horizon with prominent iron mottles.

Crookdale soils occur in close association with Wellwood soils. They are similar to Prodan soils by having a Gleyed Rego Black profile developed in fine loamy lacustrine deposits but differ from Prodan soils which develop in deep fine loamy deposits by grading to sandy deposits at depth. Crookdale soils were previously mapped as an associate of the Glenboro association in the reconnaissance soil survey of South-Central Manitoba (1943).

Croyon Series (CYN)

The Croyon series consists of moderately well to well drained Orthic Black soil developed on a mantle (25 to 100 cm) of moderately to strongly calcareous, uniform, loamy (L, SiL, CL) lacustrine sediments over moderately to strongly calcareous, stratified, deep sandy-skeletal (GrS, GrLS), glacio-fluvial deposits. These soils occur in middle and upper slope positions of very gentle slopes on undulating landscapes and have medium over rapid permeability, moderately rapid surface runoff and a low water table during the growing season. Croyon soils have medium available water holding capacity, medium organic matter content, and high natural fertility. Native vegetation often includes tall prairie grasses interspersed with aspen-oak groves. The majority of these soils are currently used for grain crop production.

In a representative profile of Croyon soil the solum is approximately 35 cm thick. The profile is characterized by a very dark gray Ah or Ap horizon, 10 to 15 cm thick, a dark brown Bm horizon, 10 to 25 cm thick, a yellowish brown IICca horizon, 10 to 20 cm thick with secondary carbonate accumulation and a light yellowish brown IICk horizon. The parent material is typically stratified with thin (<5 cm) layers of SiL, CS, GrS and SL textures.

Croyon soils occur in close association with Capell soils. They are similar to Vandal soils by having a coarse-loamy mantle over sandy-skeletal deposits at depth but differ from the Orthic Dark Gray Vandal soils in having a less strongly developed Orthic Black soil profile. Croyon soils were previously mapped as loamy surface associates of the Agassiz association in the reconnaissance soil survey of South-Central Manitoba (1943).

Croyon Series, shale gravel substrate variant (CYN1)

The Croyon series shale gravel variant, occurs in close association with typical Croyon soils and differs in having dominantly shale derived coarse fragments in the sandy-skeletal substrate.

Danlin Series (DLN)

The Danlin series consists of imperfectly drained Gleyed Dark Gray soil developed on moderately to strongly calcareous, fine loamy (CL,SiCL,SCL,L,SiL), lacustrine deposits. These soils occur in lower slope positions of very gentle to gentle slopes on rolling to undulating landscapes and have moderate permeability, moderate to moderately slow surface runoff, and a medium water table during the growing season. Danlin soils are non-eroded, non-stony, and non-saline. They have a medium available water holding capacity, medium organic matter content, and medium natural fertility. Native vegetation includes aspen, oak, shrubs and prairie grasses. The majority of these soils are currently cultivated for grain crop production.

In a representative profile of Danlin soil the solum is approximately 80 cm thick. The profile is characterized by a dark gray Ap horizon, 10 to 15 cm thick, a transitional AB horizon, 8 to 12 cm thick a very dark grayish brown to grayish brown Btjg horizon, 15 to 25 cm thick with faint mottles and a grayish brown Ck horizon, with numerous faint mottles.

Danlin soils occur in close association with Firdale and Tadpole soils. They are similar to Bone soils by having a Gleyed Dark Gray profile in lacustrine deposits but differ from them in having dominantly fine loamy rather than coarse loamy sediments. Danlin soils were previously mapped as Degrading Black Meadow associates of the Firdale Association in the Carberry (1957) soil report.

Darlingford Series (DGF)

The Darlingford series consists of well drained Orthic Black soil developed on moderately to strongly calcareous, deep, uniform, loamy (L,CL,SiCL), nearly stone-free mixed till deposits. These soils occur in middle to upper positions of very gentle to gentle slopes on undulating to rolling landscapes and have medium to moderately slow permeability, moderate surface runoff and a medium water table during the growing season. Darlingford soils are slightly eroded and slightly stony. They have moderate available water holding capacity, medium organic matter content, and high natural fertility. Native vegetation often includes tall prairie grasses interspersed with aspen poplar stands. The majority of these soils are currently used for grain crop production.

In a representative profile of Darlingford soil the solum is approximately 60 cm thick. The profile is characterized by a very dark gray Ap or Ah horizon, 15 to 20 cm thick, a black Ah horizon, 5 to 10 cm thick, a brown to dark brown Bm or Btj horizon, 20 to 30 cm thick and a pale brown Cca horizon 10 to 15 cm thick. The parent material is typically yellowish brown mixed till with few coarse fragments.

Darlingford soils occur in close association with Dezwood, Nikkel and Cazlake soils. They are similar to Nikkel soils by having a dark surface layer and well developed B horizon but differ from Nikkel soils by being well drained while Nikkel soils are imperfectly drained. Darlingford soils were previously mapped as the dominant associate of the Darlingford association in the reconnaissance soil survey of South- Central Manitoba (1943).

Dezwood Series (DZW)

The Dezwood series consists of moderately well to well drained soil developed on moderately to strongly calcareous, deep, uniform, loamy (L, CL, SiCL) mixed shale, limestone and granite till deposits. These soils occur in middle and upper positions of gentle to moderate slopes on hummocky landscapes and have medium to moderately slow permeability moderate to rapid surface runoff and a medium water table during the growing season. Dezwood soils are slightly eroded and slightly stony. They have medium available water holding capacity, medium organic matter content, and medium to high natural fertility. Native vegetation often includes tall prairie grasses interspersed with aspen-popular groves. The majority of these soils are currently used for grain crop production.

In a representative profile of Dezwood soil the solum is approximately 40 cm thick. The profile is characterized by a dark grayish brown Ah or Ap horizon, 15 to 20 cm thick, occasionally a thin light gray Ae horizon, 2 to 4 cm thick, a pale brown Bt horizon, 20 to 40 cm thick, and a light gray Cca horizon 15 to 30 cm thick. The parent material is typically light gray mixed till with few coarse fragments.

Dezwood soils occur in close association with Ferris and Nikkel soils. They are similar to Pembina soils by having been developed in a calcareous mixed regional till but differ from them by having a luvisolic Ae horizon greater than 5 cm thick in undisturbed profiles. Dezwood soils were previously mapped as gray black associates of the Pembina Association in the reconnaissance soil survey of South-Central Manitoba (1943).

Dobbin Series (DOB)

The Dobbin series consists of well drained Orthic Dark Gray soil developed on weakly to non-calcareous, deep, sandy (LFS,FS,S), lacustrine and eolian deposits. These soils occur in middle and upper positions of gentle slopes on undulating to hummocky landscapes and have rapid permeability, rapid surface runoff, and a low water table during the growing season. Dobbin soils are slightly wind eroded, non-stony, and non-saline. They have a low available water holding capacity, low organic matter content, and low natural fertility. Native vegetation includes aspen groves, bur oak, shrubs and tall prairie grasses. The majority of these soils are currently utilized for forage and crop production.

In a representative profile of Dobbin soil the solum is approximately 90 cm thick. The profile is characterized by a gray to dark gray Ap horizon, 20 to 35 cm thick, a grayish brown to brown Bm horizon, 40 to 55 cm thick, a dark grayish brown Btj or Bt horizon, 5 to 10 cm thick with clay accumulation and a transitional BC horizon, 15 to 20 cm thick. A typical profile also contains thin strata of VFSL to SiL textures.

Dobbin soils occur in close association with Stockton, Lavenham and Sewell soils. They are similar to Halstead soils by having a well drained Dark Gray profile but differ from them in having sandy rather than coarse loamy deposits. Dobbin soils were previously mapped as Degraded Black associates of the Stockton Association in the Carberry (1957) soil report.

Dorset Series (DOT)

The Dorset series consists of moderately well to well drained Orthic Black soil developed on moderately to strongly calcareous, deep, stratified, sandy to sandy skeletal (S,GrS,GrCS), outwash and glaciofluvial deposits. These soils occur in upper positions of gentle slopes on hummocky landscapes and have very rapid permeability, moderate to moderately rapid surface runoff, and a low water table during the growing season. Dorset soils are non-eroded, non-stony, and non-saline. They have a low available water holding capacity, medium organic matter content, and medium natural fertility. Native vegetation includes aspen-oak stands and tall prairie grasses. The majority of these soils are currently used for grazing or are excavated for gravel deposits.

In a representative profile of Dorset soil the solum is approximately 30 cm thick. The profile is characterized by a very dark gray Ah horizon, 12 to 18 cm thick, a dark brown Bm horizon, 15 to 22 cm thick, a Cca horizon, 6 to 12 cm thick with lime accumulation and a light brown Ck horizon, with stratified sands and gravels.

Dorset soils occur in close association with Mansfield soils. They are similar to Marringhurst soils by having well drained profile in glaciofluvial deposits but differ from them in having a Bm horizon. Dorset soils were previously mapped as Blackearth associates of the Marringhurst Association in the Carberry (1957) soil report.

Durnan Series (DRN)

The Durnan series consists of moderately well to well drained Rego Black soil developed on strongly to very strongly calcareous, deep, stratified, coarse loamy (VFSL,L,SiL), lacustrine deposits. These soils occur in upper slope and crest positions of gentle slopes on hummocky to undulating landscapes and have moderate to moderately rapid permeability, moderate to rapid surface runoff, and a low water table during the growing season. Durnan soils are occasionally slightly eroded, non-stony, and non-saline. They have medium available water holding capacity, medium organic matter content, and high natural fertility. Native vegetation includes aspen, oak, prairie grasses and shrubs. The majority of these soils are currently cultivated for grain crop production.

In a representative profile of Durnan soil the solum is approximately 10 cm thick. The profile is characterized by a very dark gray Ahk horizon, 10 to 15 cm thick, frequently a Cca horizon, 4 to 7 cm thick and a pale brown, calcareous C horizon.

Durnan soils occur in close association with Fairland, Torcan and Vordas soils. They are similar to Traverse soils by having a well drained profile in coarse loamy deposits but differ from them in having no Bmk horizon. Durnan soils were previously mapped as Blackearth associates of the Holland Association in the Carberry (1957) soil report.

Eroded Slope Complex (ERX)

This soil complex includes all the land occupied by the eroded slopes of river valleys and walls, incised stream channels and ravines that have down-cut through the surface deposits and shale bedrock. These are generally well drained, strongly to steeply sloping landforms that have variable soil development on materials that are variable in composition, depending on the nature of the surrounding deposits. Due to its complexity, this is a miscellaneous land type rather than a unit of normal soil. These areas are typically influenced by mass wasting processes such as slump, creep, solifluction and erosion.

In the study area the soils range from Orthic Blacks to Regosols. The materials are largely deep lacustrine, fluvial and eolian which are subsequently deposited as colluvium along the slopes. The slopes are characterized by numerous major seepage zones where the water table intersects the slope walls or scarps, generally in the mid to lower slopes. The maintenance of the native hardwood forest and grass vegetation on the Eroded Slopes is essential for their stability.

Fairland Series (FND)

The Fairland series consists of moderately well to well drained Orthic Black soil developed on strongly to very strongly calcareous, deep, stratified, loamy (VFSL,L,SiL), lacustrine deposits. These soils occur in upper positions of gentle slopes on rolling landscapes and have moderate permeability, moderate surface runoff, and a low water table during the growing season. Fairland soils are often slightly eroded, non-stony, and non-saline. They have a medium available water holding capacity, medium organic matter content, and high natural fertility. Native vegetation includes aspen, oak, shrubs and prairie grasses. The majority of these soils are currently cultivated for grain crop production.

In a representative profile of Fairland soil the solum is approximately 25 cm thick. The profile is characterized by a very dark gray to very dark grayish brown Ap horizon, 10 to 15 cm thick, a brown to dark brown Bm horizon, 10 to 15 cm thick a pale brown BC horizon, 5 to 10 cm thick with carbonates and a light gray Cca horizon, 5 to 10 cm thick with lime accumulation. The parent material is typically very pale brown and calcareous.

Fairland soils occur in close association with Traverse, Taggart and Vordas soils. They are similar to Durnan soils by having well developed profile in loamy deposits but differ from them in having a strongly developed Bm horizon. Fairland soils were previously mapped as Blackearth associates of the Holland Association in the Carberry (1957) soil report.

Ferris Series (FRS)

The Ferris series consists of imperfectly drained Gleyed Rego Black soil developed on moderately to strongly calcareous deep, uniform, fine loamy and fine silty, slightly stony mixed till deposits. These soils occur in lower positions of very gentle slopes on undulating landscape and have moderately slow permeability slow surface runoff and a medium water table during the growing season. Ferris soils are non-eroded, non-stony and slightly saline. They have high available water holding capacity, high organic matter content, and high natural fertility.

In a representative profile of Ferris soil the solum is approximately 30 cm thick. The profile is characterized by black, carbonated Ap horizon, 25 to 35 cm thick, a dark gray, transitional AC horizon, 15 to 30 cm thick with iron mottles, and a light gray to pale yellow Cca horizon 10 to 15 cm thick with lime accumulation. The parent material is typically light yellowish brown mixed till with iron mottles.

Ferris soils occur in close association with Nikkel soils. They are similar to Joyale soils by having a Gleyed Rego Black profile and mixed till at depth but differ because of a fine loamy lacustrine veneer (30 to 90 cm thick) overlying the mixed till. Ferris soils were previously mapped as imperfectly drained blackearth associates of the Pembina association in the reconnaissance soil survey of South-Central Manitoba (1943).

Firdale Series (FIR)

The Firdale series consists of moderately well to well drained Orthic Dark Gray soil developed on moderately to strongly calcareous, deep, fine loamy (SCL,SiCL,L,SiL), lacustrine deposits. These soils occur in upper positions of gentle to moderate slopes on undulating to dissected landscapes and have rapid permeability, moderate to rapid surface runoff, and a low water table during the growing season. Firdale soils are often moderately eroded, non-stony, and non-saline. They have medium available water holding capacity, medium organic matter content, and high natural fertility. Native vegetation includes aspen, oak and prairie grasses. The majority of these soils are currently cultivated for grain crop production.

In a representative profile of Firdale soil the solum is approximately 60 cm thick. The profile is characterized by a dark gray Ap horizon, 20 to 30 cm thick, a yellowish Bt horizon, 30 to 45 cm thick with clay accumulation, a Cca horizon, 5 to 10 cm thick, and a calcareous C horizon.

Firdale soils occur in close association with Danlin and Tadpole soils. They are similar to Halstead soils by having a well drained Orthic Dark Gray profile but differ from them in having fine loamy rather than coarse loamy deposits. Firdale soils were previously mapped as Degraded Black associates of the Firdale Association in the Carberry (1957) soil report.

Fifere Series (FFR)

The Fifere series consists of well drained Orthic Dark Gray soil developed on weakly calcareous to neutral, shallow uniform, fine loamy and fine silty (SiL, L, CL) till derived from shale bedrock. These soils occur in upper positions of gentle to moderate slopes on hummocky and ridged landscapes and have moderate permeability moderate to rapid surface runoff and a low water table during the growing season. Fifere soils are moderately eroded. They have low available water holding capacity, medium organic matter content, and medium natural fertility. Native vegetation often includes oak aspen-popular and shrubs. The majority of these soils are currently used for grain crop production.

In a representative profile of Fifere soil the solum is approximately 70 cm thick. The profile is characterized by a gray brown Ap or Ah horizon, 15 to 18 cm thick, a light brownish gray Bt horizon, 25 to 35 cm thick and a light grayish brown transitional BC horizon, 10 to 30 cm thick. The parent material is typically light grayish brown non-calcareous shale till. A typical profile also contains numerous shale fragments of various size throughout.

Fifere soils occur in close association with Manitou, Nayler and Fresno soils. They are similar to Nayler soils by having a profile developed in well drained, non-calcareous shale till but differ from Nayler soils because of the absence of an Ae horizon greater than 5 cm in thickness. Fifere soils were previously mapped as associates of the Manitou association in the reconnaissance soil survey of South-Central Manitoba (1943).

Gervais Series (GVS)

The Gervais series consists of imperfectly drained Gleyed Cumulic Regosol soil developed on moderately to strongly calcareous, deep, stratified, loamy (SiL,L,SiCL,CL), recent fluvial deposits. Flooding is a hazard where drainage has not been improved. These soils occur in middle positions of very gentle slopes on floodplain landscapes and have moderately slow to slow permeability, slow surface runoff, and a high water table during the growing season. Gervais soils are noneroded, non-stony, and frequently slightly saline. They have medium available water holding capacity, medium organic matter content, and medium natural fertility. Naitve vegetation includes elm, maple, poplar and meadow grasses. The majority of these soils are currently cultivated for crop production.

In a representative profile of Gervais soil there is no solum development. The profile is characterized by a weakly developed dark gray to gray Ah horizon, 12 to 20 cm thick, and a lighter colored Ck horizon, with stratified FSL and FS textured layers. A typical profile also contains dark coloured buried Ah horizons.

Gervais soils occur in close association with La Salle and Willowbend soils. They are similar to Poplar Point soils by having an imperfectly drained profile in loamy deposits but differ from them in having a distinct Ah horizon. Gervais soils were previously mapped as associates of the Assiniboine Complex in the Carberry (1957) soil report.

Glenboro Series (GBO)

The Glenboro series consists of moderately well to well drained Orthic Black soil developed on a mantle (25 to 90 cm) of moderately to strongly calcareous, shallow, loamy (VFSL,L,SiL), lacustrine deposits over moderately calcareous, stratified, deep, sandy (FS,LFS,LS) deposits. These soils occur in upper positions of gentle slopes on sloping to undulating landscapes and have moderate over moderately rapid permeability, moderately slow surface runoff, and a low water table during the growing season. Glenboro soils are often slightly eroded, non-stony, and non-saline. They have a medium available water holding capacity, high organic matter content, and high natural fertility. Native vegetation includes tall prairie grasses and aspen-oak groves. The majority of these soils are currently cultivated for grain crop production.

In a representative profile of Glenboro soil the solum is approximately 30 cm thick. The profile is characterized by a very dark gray to black Ah horizon, 12 to 18 cm thick, with granular structure, a dark brown to brown Bm or Btj horizon, 10 to 16 cm thick with subangular blocky structure, a brown to pale brown BC horizon, 6 to 14 cm thick and a light gray to very pale brown Cca horizon, 5 to 8 cm thick. The parent material is typically pale brown to light yellowish brown sandy. Some stratified sands to loams may occur in the loam/sand transition.

Glenboro soils occur in close association with Grover and Grayson soils. They are slimilar to Fairland soils by having an Orthic Black profile and loamy surface mantle but differ from them in having a sandy substrate. Glenboro soils were previously mapped as Blackearth associates of the Glenboro Association in the Carberry (1957) soil report.

Grover Series (GRO)

The Grover series consists of imperfectly drained Gleyed Rego Black soil developed on a mantle (25 to 75 cm) of moderately to strongly calcareous, shallow, loamy (VFSL,L,SiL), lacustrine deposits over moderately calcareous, deep, sandy (FS,LFS,LS), lacustrine deposits. These soils occur in middle positions of very gentle slopes on undulating landscapes and have moderate over moderately rapid permeability, moderately slow surface runoff, and a high water table during the growing season. Gover soils are non-eroded, non-stony, and non-saline. They have medium available water holding capacity, high organic matter content, and medium natural fertility. Native vegetation includes aspen oak, ash and tall prairie grasses. The majority of these soils are currently cultivated for grain crop production.

In a representative profile of Grover soil the solum is approximately 20 cm thick. The profile is characterized by a very dark gray to black Ah or Ahk horizon, 15 to 25 cm thick, a dark grayish brown AC horizon, 15 to 20 cm thick with faint mottles, a Cca horizon, 5 to 8 cm thick, and a light yellowish brown, sandy Ck horizon, with yellowish brown mottles.

Grover soils occur in close association with Glenboro and Grayson soils. They are similar to Crookdale soils by having an imperfectly drained profile with a sandy substrate but differ from them in having a loamy rather than fine loamy surface. Grover soils were previously mapped as Black Meadow associates of the Glenboro Association in the Carberry (1957) soil report.

Guerra Series (GRR)

The Guerra series consists of poorly drained Rego Humic Gleysol soil developed on a mantle (35 to 100 cm) of moderately to strongly calcareous, uniform, fine loamy (CL, L, SiCL), lacustrine deposits over moderately to strongly calcareous, deep, uniform, fine loamy (CL, L, SiCL), mixed till deposits. These soils occur in level to depressional positions of very gentle slopes on hummocky landscapes and have slow permeability very slow surface runoff and a high water table during the growing season. Guerra soils are occasionally slightly saline. They have a medium available water holding capacity, high organic matter content, and low natural fertility. Native vegetation often includes sedges, rushes and willows. The majority of these soils are currently used for natural grazing.

In a representative profile of Guerra the soil solum is approximately 25 cm thick. The profile is characterized by a black Ah or Ahk horizon, 15 to 30 cm thick, a very dark gray transitional AC horizon, 5 to 15 cm thick with many prominent iron mottles, and a dark olive gray Ck horizon with many prominent iron mottles. The parent material is relatively free of coarse fragments.

Guerra soils occur in close association with Knudson, Joyale and Ullrich soils. They are similar to Narish soils by having a Rego Humic Gleysol profile developed in mixed calcareous till but differ from Narish soils because Narish profiles are associated with Dark Gray soils while Guerra profiles are associated with Black soils. Guerra soils were previously mapped as the poorly drained blackearth associate of the Altamont association, in the reconnaissance soil survey of South-Central Manitoba (1943).

Halstead Series (HAT)

The Halstead series consists of well to moderately well drained Orthic Dark Gray soil developed on weakly calcareous, deep, stratified, coarse loamy and coarse silty (FSL,VFS,LVFS,VFSL,L,SiL), lacustrine deposits. These soils occur in upper positions of very gentle to gentle slopes on hummocky landscapes and have moderate to moderately rapid permeability, moderate to rapid surface runoff, and a low water table during the growing season. Halstead soils are frequently moderately eroded, non-stony, and non-saline. They have a medium available water holding capacity, medium organic matter content, and high natural fertility. Native vegetation includes aspen, scrub oak, shrubs and prairie grasses. The majority of these soils are currently cultivated for grain crop production.

In a representative profile of Halstead soil the solum is approximately 50 cm thick. The profile is characterized by a very dark gray Ah or Ap horizon, 20 to 30 cm thick, a weakly developed brown Bm horizon, 15 to 25 cm thick, a prominent brown Bt horizon, 5 to 10 cm thick and a brown Ck or Ckgj horizon. A typical profile also contains thin layers of SiCL and SiL textures.

Halstead soils occur in close association with Bone and Poolex soils. They are similar to Firdale soils by having an Orthic Dark Gray profile but differ from them in having coarse loamy rather than fine loamy deposits. Halstead soils were previously mapped as coarser associates of the Firdale Association in the Carberry (1957) soil report.

Harding Series (HRG)

The Harding series consists of imperfectly drained Gleyed Black soils developed on moderately to strongly calcareous, silty clay to clay lacustrine deposits. These soils occur on level to very gently sloping topography. Runoff is slow; permeability is moderately slow to slow. Most of these soils occur within a discharge region characterized by an upward pressure of groundwater or a lateral flow of water through the underlying very strongly calcareous till which may occur at a depth of one to two meters. Appreciable soluble salts may be present within the rooting zone and gypsum crystals are common.

The soil is characterized by a very dark gray Ah horizon 12 to 22 cm thick, a dark grayish brown, prismatic to subangular blocky Bmgj horizon, 15 to 20 cm thick with fine yellowish brown mottles; a lime accumulation horizon is common. Salt pseudomycelium and gypsum concretions are common in the olive brown to olive Ckgj horizon.

Hebbot Series (HEB)

The Hebbot series consists of well drained Rego Black soil developed on strongly to very strongly calcareous, deep, uniform, loamy (L,CL,SiCL), glacial till deposits derived from limestone, granite and shale. These soils occur in upper and crest positions of moderate to strong slopes on hummocky landscapes and have moderate to moderately rapid permeability, moderate surface runoff, and a low water table during the growing season. Hebbot soils are severely water eroded, slightly stony, and non-saline. They have a medium available water holding capacity, low organic matter content, and medium natural fertility. Native vegetation includes scrub oak, aspen, shrubs and prairie grasses. The majority of these soils are currently cultivated for grain and forage production.

In a representative profile of Hebbot soil the solum is eroded. The profile is characterized by a dark gray to very dark gray Ah horizon, 10 to 15 cm thick, a brown to pale brown Cca horizon, 10 to 15 cm thick, and a yellowish brown Ck horizon.

Hebbot soils occur in close association with Darlingford, Nikkel and Cazlake soils. They are similar to Darlingford soils by having a well drained profile in loamy till but differ from them in having no Bm horizon. Hebbot soils were previously mapped as Calcareous Black associates of the Darlingford Association in the South Central (1943) soil report.

Hickson Series (HKS)

The Hickson series consists of poorly drained carbonated Rego Humic Gleysol soils developed on a thin mantle (50 to 75cm) of very strongly to extremely calcareous loamy (L, SiL, SiCL, CL) glacial till of limestone and granitic origin overlying strongly calcareous loam to clay loam glacial till of shale, limestone, and granitic origin. They occur in level to depressional (pothole) topography and are subject to ponding and prolonged saturation. Runoff is negligible, and permeability is very slow. Soluble salts may occur in the soil in areas of seepage or upward movement of groundwater containing appreciable soluble salts.

The soil is characterized by a moderately decomposed organic layer 2 to 5 cm thick, a very dark gray, carbonated Ah horizon, and a thin gray to olive gray AC horizon with mottles. The C horizon is pale olive and may contain yellowish brown mottles.

Hilton Series (HIT)

The Hilton series consists of well drained Orthic Black soil developed on strongly to extremely calcareous, thin, uniform, fine loamy (L, CL, SiCL) boulder till of limestone and granite origin. These soils occur in upper slope positions of moderate slopes on hummocky landscapes and have moderate permeability rapid surface runoff and a low water table during the growing season. Hilton soils are moderately eroded, moderately stony and non-saline. They have medium available water holding capacity, medium organic matter content, and medium natural fertility. Native vegetation often includes tall prairie grasses interspersed with aspen-oak groves. The majority of these soils are currently used for forage crop production and improved pasture.

In a representative profile of Hilton soil the solum is approximately 30 cm thick. The profile is characterized by a very dark gray Ah or Ap horizon, 10 to 20 cm thick, a dark brown Bm horizon, 5 to 15 cm thick, a very pale brown Cca horizon, 10 to 40 cm thick and a yellowish brown Ck horizon. The parent material is typically very stony. A typical profile also contains appreciable amounts of unaltered carbonate minerals.

Hilton soils occur in close association with Hickson soils. They are similar to Tiger Hills soils by having a well drained, very thin soil profile developed in strongly to extremely calcareous glacial till but differ from them in having a less strongly leached soil profile. Tiger Hills soils have eluvial Ae or Ahe horizons and illuvial Bt horizons while Hilton soils do not. Hilton soils were previously mapped as dominant associates of the Hilton association in the reconnaissance soil survey of South-Central Manitoba (1943).

Hochfeld Series (HHF)

The Hochfeld series consists of moderately well drained Orthic Black soil developed on moderately calcareous, coarse loamy (VFS,LVFS,FSL,SL), lacustrine deposits. These deposits range in thickness from 1.5 to 5 meters over finer textured lacustrine sediments. These soils occur in upper positions of very gentle slopes on undulating landscapes and have moderately rapid permeability, moderate surface runoff, and a low water table during the growing season. Hochfeld soils are often slightly eroded, non-stony, and non-saline. They have a medium available water holding capacity, medium organic matter content, and high natural fertility. Native vegetation includes aspen oak, shrubs and prairie grasses. The majority of these soils are currently cultivated for grain crop production.

In a representative profile of Hochfeld soil the solum is approximately 50 cm thick. The profile is characterized by a dark gray to very dark gray Ah horizon, 15 to 25 cm thick, a brown Bm horizon, 15 to 40 cm thick, usually a light brown Cca horizon, 5 to 8 cm thick, and a brown Ck horizon, with many faint mottles.

Hochfeld soils are similar to Halstead soils in texture and drainage but lack a diagnostic Bt horizon. Hochfeld soils were previously mapped as Blackearth associates of the Almasippi Association in the Carberry (1957) soil report.

Hummerston Series (HMO)

The Hummerston series consists of imperfectly drained Gleyed Rego Black soil developed on weakly to moderately calcareous, deep, uniform, sandy (FS,LFS,LS), lacustrine and fluvial deposits. These soils occur in middle to lower positions of very gentle slopes on undulating landscapes and have moderately rapid permeability, moderately slow surface runoff, and a high water table during the growing season. Hummerston soils are often slightly wind eroded, non-stony, and slightly saline. They have a low available water holding capacity, medium organic matter content, and medium natural fertility. Native vegetation includes aspen-oak groves, shrubs, tall prairie and meadow grasses. The majority of these soils are currently cultivated for forage and grain crops. In a representative profile of Hummerston soil the solum is approximately 20 cm thick. The profile is characterized by a very dark gray Ah horizon, 15 to 20 cm thick, a dark gray AC horizon, 10 to 18 cm thick with moderate calcareousness, and a yellowish brown Ck horizon, with prominent yellow mottles.

Hummerston soils occur in close association with Stockton, Lavenham and Sewell soils. They are similar to Lavenham soils by having an imperfectly drained profile in sandy deposits but differ from them in having no diagnostic Bm Horizon. Hummerston soils were previously mapped as Black Meadow associates of the Stockton Association in the Carberry (1957) soil report.

Janick Series (JIK)

The Janick series consists of well to moderately well drained Orthic Black soil developed on moderately to strongly calcareous, deep, uniform, clayey (C,SiC), lacustrine deposits. These soils occur in upper positions of nearly level slopes on undulating landscapes and have slow permeability, moderately slow surface runoff, and a medium water table during the growing season. Janick soils are non-eroded, non-stony, and non-saline. They have a high available water holding capacity, high organic matter content, and high natural fertility. Native vegetation includes prairie grasses. The majority of these soils are currently cultivated for grain crop production.

In a representative profile of Janick soil the solum is approximately 30 cm thick. The profile is characterized by a very dark gray to black Ah horizon, 10 to 18 cm thick, a dark grayish brown to brown Bm horizon, 8 to 15 cm thick with fine subangular blocky structure, a pale brown BC horizon, 5 to 10 cm thick with weak calcareousness and a light grayish brown to pale brown Ck horizon, with a few faint mottles.

Janick soils occur in close association with Harding soils. They are similar to Winkler soils by having a well drained profile in clayey deposits but differ from them in having no stratified fine loamy deposits in the substrata. Janick soils were previously mapped as Blackearth associates of the Harding Association in the Carberry (1957) soil report.

Jaymar (JAY)

The Jaymar series consists of well drained, Orthic Black soils developed on stratified materials composed of a thin mantle (40 to 70 cm) of moderately to strongly calcareous, loamy (L, CL), lacustrine sediments over a thin 30 to 60 cm, contact zone of sandy skeletal (S, GrS) materials, overlying moderately to strongly calcareous, loamy (L, CL, SiCL), glacial till of shale, limestone and grantic rock origin. The soils occur on very gently to gently sloping topography, runoff is moderate, permeability is moderate to rapid in the upper loamy and sandy skeletal strata and moderately slow in the underlying till. These soils are often stony due to the modification of the till.

The soil is characterized by a very dark gray Ah horizon 10 to 15 cm thick, a dark brown to brown Bm horizon 8 to 15 cm thick and a lime accumulation layer (Cca) that occurs at the contact of the loamy sediments and underlying coarser wash zone.

Jaymar soils occur as well drained inclusions of the Heaslip Complex in the South-Central (1943) soil report.

Joyale Series (JYL)

The Joyale series consists of imperfectly drained Gleyed Rego Black soil developed on a mantle (25 to 100 cm) of moderately to strongly calcareous, uniform, fine loamy (L, CL, SICL), lacustrine deposits over moderately to very strongly calcareous, deep uniform, fine loamy (CL, SICL), mixed till deposits. These soils occur in lower slope positions of very gentle slopes on undulating landscapes and have moderate permeability slow surface runoff and a medium water table during the growing season. Joyale soils are usually slightly saline. They have a medium available water holding capacity, medium organic matter content, and medium natural fertility. Native vegetation often includes tall prairie and meadow grasses. The majority of these soils are currently used for grain crop production.

In a representative profile of Joyale soil the solum is approximately 25 cm thick. The profile is characterized by a very dark gray to black Apk or Ahk horizon, 15 to 25 cm thick, a light gray Cca or AC horizon, 5 to 15 cm thick with distinct iron mottles, and a very pale brown IICk horizon with many prominent iron mottles. A typical profile also contains a thin pebble line at the lacustrine/till contact.

Joyale soils occur in close association with Knudson, Ullrich and Guerra soils. They are similar to Prodan soils by having a Gleyed Rego Black profile developed dominantly in imperfectly drained fine loamy deposits but differ from Prodan soils because of the presence of a compact till substrate within a meter of the mineral surface. Joyale soils were previously mapped as minor, imperfectly drained blackearth associates of the Altamont association in the reconnaissance soil survey of South-Central Manitoba (1943).

Kingsley Series (KIS)

The Kingsley series consists of moderately well to well drained Orthic Dark Gray Luvisol soil developed on a mantle (25 to 100 cm) of weakly to moderately calcareous, uniform, fine loamy (CL, SiCL), lacustrine deposits over moderately to strongly calcareous, deep, uniform, fine loamy (CL, L), mixed till deposits. These soils occur in upper slope positions of very gentle slopes on hummocky landscapes and have moderate permeability, moderate surface runoff and a low water table during the growing season. Kingsley soils are slightly water eroded. They have a medium available water holding capacity, medium organic matter content, and high natural fertility. Native vegetation often includes forests of bur-oak and aspen. The majority of these soils are currently used for grain crop production.

In a representative profile of Kingsley soil the solum is approximately 60 cm thick. The profile is characterized by a grayish brown Ahe or Ap horizon, 10 to 20 cm thick, a light gray Ae horizon, 10 to 15 cm thick with fine platy structure, a light yellowish brown, transitional AB horizon, 10 to 25 cm thick, a pale brown Bt horizon, 5 to 15 cm thick with clay skins, a light yellowish brown transitional IIBC horizon, 10 to 20 cm thick, and a very pale brown IICk horizon. The till substrate is commonly mixed till but can also be dominantly shaley till.

Kingsley soils occur in close association with Altamont soils. Kingsley soils were previously mapped as gray-wooded associates of the Altamont association in the reconnaissance soil survey of South-Central Manitoba (1943).

Knudson Series (KUD)

The Knudson series consists of moderately well to well drained Orthic Black soil developed on a shallow mantle (30 to 100 cm) of weakly to moderately calcareous thin, uniform, fine loamy to clayey, glaciolacustrine deposits, over moderately to strongly calcareous, deep, uniform, fine loamy to fine silty mixed till deposits. These soils occur in middle positions of very gentle slopes on undulating landscape and have medium permeability, moderate surface runoff and a medium water table during the growing season. Knudson soils have moderate available water holding capacity, moderate organic matter content, and high natural fertility.

In a representative profile of Knudson soil the solum is approximately 60 cm thick. The profile is characterized by a black Ap horizon, 15 to 25 cm thick, with a brown to grayish brown Bm horizon 8 to 12 cm thick with medium subangular blocky structure, a very pale brown Cca horizon 6 to 10 cm thick, and a yellowish brown IICk horizon. A typical profile also contains a thin pebble line at the lacustrine-till interface.

Knudson soils occur in close association with Joyale and Guerra soils. They are similar to Darlingford soils by having similar profile characteristics but differ from them in having a thin mantle of fine loamy to clayey glaciolacustrine deposits overlying glacial till. Knudson soils were previously mapped as blackearth associates of the Altamont association in the reconnaissance soil survey of South-Central Manitoba (1943).

Landseer Series (LSR)

The Landseer series consists of poorly drained Rego Humic Gleysol soil developed on a mantle (25 to 100 cm) of moderately to strongly calcareous, uniform, clayey (SiC, C), lacustrine sediments over moderately to strongly calcareous, stratified, deep, loamy (L, SiL, VFSL) lacustrine deposits. These soils occur in lower positions of nearly level slopes on level landscapes and have very slow permeability, very slow surface runoff, and a high water table during the growing season. Landseer soils are non-eroded, non-stony, and usually strongly saline. They have a high available water holding capacity, high organic matter content, and low natural fertility. Native vegetation includes salt tolerant grasses and hydrophytic vegetation. The majority of these soils are currently in native grasses.

In a representative profile of Landseer soil the solum is approximately 25 cm thick. The profile is characterized by thick black A horizon, 20 to 25 cm thick, with evidence of salinity, a Cca horizon, 25 to 50 cm thick, and a dark gray C horizon, with many prominent mottles and salt crystals.

Landseer soils occur in close association with Oliver soils. They are similar to Tadpole soils by having Rego Humic Gleysol profile but differ from them in having clayey as compared to fine loamy sediments. Landseer soils were previously mapped as marshland inclusions of the Heaslip complex in the reconnaissance survey of South-Central Manitoba (1943).

La Salle Series (LSL)

The La Salle series is characterized by a moderately well drained Cumulic Humic Regosol solum, and moderately to strongly calcareous loamy (L, SiL, SiCL, CL) stratified recent fluvial sediments. These soils occur in the western part of the Red River Plain on gently sloping to irregular topography in upper terraces, levees and meander scrolls along the Assiniboine, Elm, La Salle and Boyne Rivers. These soils are subject to occasional flooding during periods of exceptional stream flows. Runoff is moderate; permeability is moderate. Native vegetation consists dominantly of deciduous trees, elm, ash, basswood and Manitoba maple and some tall prairie grasses.

The profile has a weakly developed dark gray Ah horizon that is somewhat darker than the C horizon. The underlying material are stratified with dominantly silt loam to silty clay loam textures and thin strata of very fine sand, fine sand or silty clay. In some areas, the solum in the moist state appears to have development of a Bmk with weak blocky structure.

Lavenham Series (LVH)

The Lavenham series is a Gleyed Black soil developed on imperfectly drained, weakly to moderately calcareous, sandy (FS, LFS, LS), lacustrine sediments. These soils occur in the Upper Assiniboine Delta on level to very gently sloping topography, in association with Stockton, Cactus, Hummerston and Sewell soils. Surface runoff is slow, and permeability is moderately rapid. Downward movement of water is restricted in the subsoil during periods of high water table. The water table ranges from 1 meter shortly after spring runoff, to 3 meters below the surface in late fall and winter. These soils are also susceptible to erosion.

The Lavenham soil profile has a very dark gray to very dark brown Ah horizon, 18 to 25 cm thick; a dark brown to yellowish brown Bmgj horizon, 20 to 40 cm thick, with distinct brown mottles in the lower part of the horizon; a lime carbonate accumulation (Ccagj) horizon, 12 to 20 cm thick, and a pale brown Ckgj horizon with distinct to prominent brown mottles. This soil profile differs from the very similar Hummerston soil series in having a prominent Bmgj horizon. Lavenham and Hummerston soils are coarse textured and more permeable than the finer textured Gateside and Pleasant soils.

Lavenham soils were previously mapped as Black Meadow associates of the Stockton Association in the Carberry (1957) soil report.

Leary Series (LRY)

The Leary series consists of well to rapidly drained Orthic Dark Gray soil developed on moderately to strongly calcareous, deep, stratified, sandy to sandy-skeletal (LCS, GrLS), glaciofluvial deposits. These soils occur in middle to upper slope positions of moderate slopes on hummocky landscapes and have very rapid permeability moderate surface runoff and a low water table during the growing season. Leary soils have low available water holding capacity, low organic matter content, and low natural fertility. Native vegetation often includes forests of dominantly burr oak. The majority of these soils are currently excavated for road construction and the aggregate industry.

In a representative profile of Leary soil the solum is approximately 50 cm thick. The profile is characterized by a dark gray Ah or Ap horizon, 10 to 20 cm thick, a dark brown Bt or Btj horizon, 5 to 20 cm thick, a brown transitional BC horizon, 15 to 30 cm thick and a light yellowish brown Ck horizon with thin layers of coarse sand, fine sand and gravel

Leary soils are similar to Vandal soils by having an Orthic Dark Gray soil profile and sandy-skeletal substrate material but differ from Vandal soils in not having 25 to 100 cm of loamy surface over the sandy-skeletal substrate. Leary soils were previously mapped as the dominant associate of the Leary association in the reconnaissance soil survey of South-Central Manitoba (1943).

Leary Series, coarse-loamy substrate variant (LRY1)

The Leary series, coarse-loamy (SIL, VFSL) substrate variant, occurs in close association with typical Vandal soils and differs from them in having a light yellowish brown, relatively stone-free coarse-loamy substrate.

Levine Series (LEI)

The Levine series consists of imperfectly drained Gleyed Cumulic Regosol soil developed on moderately to strongly calcareous, deep, stratified, coarse loamy to fine loamy (VFSL, L, CL) recent alluvial deposits. These soils occur in flood plains on level slopes in level landscapes. They have rapid permeability, moderately slow surface runoff and a medium water table during the growing season. Levine soils are occasionally slightly saline and are subject to periodic inundation during spring runoff or after heavy rains. They have a moderate to low available water holding capacity, low organic matter content and medium natural fertility. The majority of these soils are currently used for grain crop production.

In a representative profile of Levine soil the solum is approximately 15 cm thick. The profile is characterized by a dark gray Apk or Ahk horizon 10 to 20 cm thick and a light yellowish brown Ck horizon. The underlying strata may vary in colour from light to dark. The thin dark colored mineral and organic layers are former surface horizons that have been exposed to soil forming processes for a significant period before burial by alluvial deposits. Medium, distinct yellowish brown iron mottles occur through the soil.

Levine soils were previously mapped as inclusions of Eroded Slope Complexes in the reconnaissance soil survey of South-Central Manitoba.

Lowton Series (LWN)

The Lowton series consists of poorly drained Rego Humic Gleysol soil developed on moderately to strongly calcareous, clayey, (SiC, C), lacustrine deposits. These soils occur in lower to depressional positions of level slopes on level landscapes and have very slow permeability, very slow surface runoff, and a high water table during the growing season. Lowton soils are non-eroded, non-stony, and moderately saline. They have a high available water holding capacity, high organic matter content, and low natural fertility. Native vegetation includes native grasses, willows and sedges. The majority of these soils are currently under native vegetation.

In a representative profile of Lowton soil the solum is approximately 20 cm thick. The profile is characterized by moderately decomposed LFH horizon, 1 to 5 cm thick, a very dark gray Ah horizon, 5 to 20 cm thick with carbonates, and a dark gray to olive gray CK horizon, with many mottles and carbonate concentrations. A typical profile also contains till at 1 to 2.5 m below the surface. Lowton, soils occur in close association with Sigmond and Janick soils. They are similar to Landseer soils by having a Rego Humic Gleysol profile developed in clayey sediments but differ from them in having uniform textures throughout while Landseer soils are stratified at depth. Lowton soils were previously mapped as minor inclusions of the Oliver Association in the South-Central Manitoba (1943) reconnaissance soil survey.

Marringhurst Series (MRH)

The Marringhurst series consists of moderately well to well drained Calcareous Black soil developed on moderately strongly to strongly calcareous, stratified, deep, sandy (CS,S,LS) and sandy skeletal (GrS,GrCS) glaciofluvial deposits. These soils occur in upper positions of very gentle slopes on rolling to irregular landscapes and have very rapid permeability, moderate to rapid surface runoff, and a low water table during the growing season. Marringhurst soils are often moderately eroded, non-stony, and non-saline. They have a low available water holding capacity, low organic matter content, and low natural fertility. Native vegetation includes shrubs, bur oak, and prairie grasses. The majority of these soils are currently excavated for gravel or used for grasing.

In a representative profile of Marringhurst soil the solum is approximately 25 cm thick. The profile is characterized by a very dark gray to very dark grayish brown Ah horizon, 14 to 18 cm thick, a dark brown to brown Bmk horizon, 10 to 18 cm thick, a Cca horizon, 20 to 30 cm thick with coarser gravelly strata and a Ck horizon.

Marringhurst soils occur in close association with Dorset, Dexter and Fortina soils. They are similar to Dorset soils by having a well drained profile in sandy skeletal deposits but differ from them in having a Bmk rather than Bm horizon. Marringhurst soils were previously mapped as the dominant associate of the Marringhurst Association in the Carberry (1957) soil report.

Marringhurst Series, shale gravel substrate variant (MRH1)

The Marringhurst series, shale gravel variant, occurs in close association with normal Marringhurst soils and differs from them in having a dominantly shale derived gravel.

Marsden Series (MDN)

The Marsden series consists of poorly drained Rego Humic Gleysol, carbonated soils developed on a sequence of strata consisting of a thin lacustrine mantle (25 to 60 cm) of moderately to strongly calcareous loamy sediments (VFSL to SiCL) over thin (10 to 40 cm) of medium sand to gravel strata over strongly calcareous loam to clay loam glacial till of shale, limestone and granitic origin. The topography is level to depressional; runoff is negligible, and permeability is restricted during periods when free water is at or near the surface.

The soils are characterized by a thin, moderately decomposed organic layer, 1 to 4 cm, a very dark gray Ah horizon, 12 to 18 cm and an olive brown AC frequently developed in the sand strata. The C horizon is olive gray with many prominent mottles and usually occurs at the till contact. Marsden soils were previously mapped as minor associates of the Heaslip complex in the Reconnaissance soil survey of South-Central Manitoba (1943).

Marsh Complex (MHC)

The Marsh complex consists of very poorly drained, Rego Gleysol soils developed on lacustrine clay or thin mucky loam deposits over extremely calcareous till and/or moderately calcareous clay. These soils occur on level to depressional areas that are covered with water and are usually saturated for most of the year. The native vegetation consists entirely of reeds and sedges.

These soils have a thin surface layer of either muck or mineral material high in organic matter content and are underlain by strongly gleyed, olive gray mineral materials. A very thin Ahg horizon, less than 2.5 cm thick, may be present below the muck surface layer.

Marsh soils are undifferentiated with respect to texture and composition of their parent material. They also are much more poorly drained than other Gleysolic soils.

Melland Series (MXT)

The Melland series consists of the imperfectly drained, Gleyed Rego Black carbonated soils developed on a sequence of materials consisting of a thin mantle (25 to 60 cm) of moderately to strongly calcareousloamy

(VFSL to SiCL) sediment over a thin (10 to 40 cm) layer of medium sand to gravel strata over strongly calcareous loam to clay loam glacial till of shale, limestone, and granitic origin. Topography is level to gently sloping; runoff is moderately slow; permeability is moderate in the upper strata, but restricted above the till due to perched water conditions. Lateral flow of water occurs through the gravel strata during the spring or following heavy rains.

The soil is characterized by a very dark gray Ah horizon 18 to 25 cm thick, and a dark gray to grayish brown ACk horizon, 10 to 15 cm thick. A lime accumulation horizon is usually present at the transition from loamy to gravel strata. Melland soils are more permeable than the very similar, finer textured Beresford series.

Mockry Series (MKY)

The Mockry series consists of poorly drained Rego Humic Gleysol soil developed on weakly to noncalcareous, stratified, deep, sandy (FS,LFS,S) eolian deposits. These soils occur in depressional positions of moderate slopes on hummocky landscapes and have rapid permeability, slow surface runoff, and a high water table during the growing season. Mockry soils are non-eroded, nonstony, and often slightly saline. They have a low available water holding capacity, high organic matter content, and low natural fertility. Native vegetation includes rushes, sedges, reeds and willows. The majority of these soils are currently in native vegetation.

In a representative profile of Mockry soil the solum is approximately 15 cm thick. The profile is characterized by a moderately decomposed organic horizon, 2 to 5 cm thick, a very dark gray Ah horizon, 10 to 10 cm thick, an olive gray AC horizon, 10 to 15 cm thick with moderate calcareous and frequently a Cca horizon, 5 to 8 cm thick. The parent material is typically olive gray and mottled.

Mockry soils occur in close association with Shilox and Onahan soils. They are similar to Sewell soils by having a poorly drained profile in sandy deposits but differ from them in having deposits of eolian rather than lacustrine origin. Mockry soils were previously mapped as Meadow associates of the Stockton Association in the Carberry (1957) soil report.

Mowbray Series (MOW)

The Mowbray series consists of a well drained, Cumulic Regosol soil developed on deep, moderately to strongly calcareous, loamy (L, SiL, CL, SiCL) recent alluvial sediments. These deposits are stratified and contain dark colored bands of former Ah horizons in the profile. The soils are located in upper terrace and flood plain areas that have been inundated during years of high flood waters. They occur in association with the Levine and Basker soils. Topography is very gently to moderately sloping, runoff is moderate and permeability is moderate.

The soil is characterized by a dark gray to gray surface horizon (Ah or Ap) 8 to 20 cm thick and a lighter colored (C) substratum with dark bands consisting of former organic layers or buried Ah horizons. These soils may exhibit weak profile development.

Narish Series (NSH)

The Narish series consists of poorly drained Rego Humic Gleysol soil developed on a mantle (25 to 100 cm) of moderately to strongly calcareous, uniform, fine loamy (CL, L, SICL), lacustrine deposits over moderately to strongly calcareous, deep, uniform, fine loamy (CL, L, SICL), mixed till deposits. These soils occur in level to depressional positions of very gentle slopes on hummocky landscapes and have slow permeability very slow surface runoff and a high water table during the growing season. Narish soils are occasionally slightly saline. They have a medium available water holding capacity, high organic matter content, and low natural fertility. Native vegetation often includes sedges, rushes and willows. The majority of these soils are currently used for natural grazing.

In a representative profile of Narish soil the solum is approximately 25 cm thick. The profile is characterized by a black Ah or Ahk horizon, 15 to 30 cm thick, a very dark gray transitional AC horizon, 5 to 15 cm thick with many, fine, prominent iron mottles, and a dark olive gray C horizon with many, fine prominent, iron mottles. The parent material is typically relatively free of coarse fragments.

Narish soils occur in close association with Altamont and Tellier soils. Narish soils are virtually the same as Guerra soils differing from them only because they occur in close association with Dark Gray soils found in locally more cool soil climate areas. Narish soils were previously mapped as poorly drained minor associates of the Altamont association in the reconnaissance soil survey of South-Central Manitoba (1943).

Nayler Series (NYO)

The Nayler series consists of well to rapidly drained Orthic Dark Gray Luvisol soil developed on weakly calcareous to neutral, uniform, deep, fine loamy to fine silty (SIL, L, CL), glacial till of shale bedrock origin. These soils occur in upper slope and crest positions of gentle to moderate slopes on hummocky to ridged landscapes and have rapid permeability rapid surface runoff and a low water table during the growing season. Nayler soils are slightly eroded, slightly stony and non-saline. They have a low available water holding capacity, low organic matter content, and low natural fertility. Native vegetation often includes forests of burr oak and aspen poplar. The majority of these soils are currently used for improved pasture and forage crop production.

In a representative profile of Nayler soil the solum is approximately 90 cm thick. The profile is characterized by a gray brown Ap or Ah horizon, 15 to 20 cm thick, a light yellowish brown Ae horizon, 5 to 30 cm thick with fine, platy structure, a light yellowish gray Bt horizon 20 to 60 cm thick with thin clay skins and a yellowish brown non-calcareous C horizon. The parent material is typically composed of gray shaly till containing weathered Odanah shale fragments.

Nayler soils occur in close association with Fifere and Fresno soils. They are similar to Fifere soils by having well drained profiles developed in non-calcareous shale till but differ from Fifere soils by possessing Ae horizons below their Ap or Ahe horizons at least 5 cm thick. Nayler soils were previously mapped as graywooded associates of the Snowflake association in the reconnaissance soil survey of South-Central Manitoba (1943).

Nikkel Series (NKK)

The Nikkel series consists of imperfectly drained Gleyed Black soil developed on moderately to strongly calcareous deep, uniform, fine loamy and coarse loamy (L, CL, SICL), mixed till deposits of granite, limestone and shale origin. These soils occur in lower slope positions of gentle slopes on hummocky landscapes and have moderate permeability moderately slow surface runoff and a medium water table during the growing season. Nikkel soils are non-eroded, slightly stony and occasionally slightly saling. They have a medium available water holding capacity, medium organic matter content, and medium natural fertility. Native vegetation often includes tall prairie and meadow grasses. The majority of these soils are currently used for grain crop production.

In a representative profile of Nikkel soil the solum is approximately 45 cm thick. The profile is characterized by a black Ap or Ah horizon, 20 to 25 cm thick, a dark grayish brown Bm horizon, 5 to 15 cm thick with many, faint, fine iron mottles, a light gray Cca horizon, 5 to 10 cm thick of lime accumulation and a pale brown Ck horizon with many, fine, distinct iron mottles. The parent material is typically relatively stone-free.

Nikkel soils occur in close association with Darlingford, Ferris and Cazlake soils. They are similar to Ullrich soils by having Gleyed Black profile and a fine-loamy till substrate but differ from them in not having 25 to 100 cm of lacustrine veneer overlying the till substrate. Nikkel soils were previously mapped as imperfectly drained blackearth associates of the Darlingford association in the reconnaissance soil survey of South-Central Manitoba.

Oberon Series (OBR)

The Oberon series consists of imperfectly drained Gleyed Black soils developed on a thin mantle (<1 m) of strongly calcareous clay loam to sandy clay loam sediments grading to moderately calcareous sandy (FS,LFS,LS) deposits. They occur on level to gently sloping topography. Runoff is moderate to moderately slow; permeability is moderate in the upper loamy strata and moderately rapid in the sandy subsoil when not restricted by a high water table in early spring or summer.

The soil is characterized by a very dark gray Ah horizon, 18 to 25 cm thick, a subangular blocky brown to olive brown Bmgj horizon, 12 to 22 cm thick with yellowish brown mottles in the lower part of the horizon; a BCkg horizon, 8 to 16 cm thick. A lime accumulation is usually present within the loamy strata. The sandy substrata is light yellowish brown with yellowish brown to strong brown mottles of iron.

Oliver Series (OIV)

The Oliver series consists of imperfectly drained Gleyed Black Solonetz soil developed on a mantle (25 to 100 cm) of moderately to strongly calcareous, uniform, clayey (SiC, C), lacustrine deposits over moderately to strongly calcareous, stratified, deep coarse loamy to sandy (L, SL, LS) lacustrine deposits. These soils occur in middle slope positions of very gentle slopes on level landscapes and have slow permeability very slow surface runoff and a high water table during the growing season. Oliver soils are non-eroded, non-stony and slightly saline. They have a high available water holding capacity, medium organic matter content, and medium natural fertility.

Native vegetation often includes tall prairie and salt-tolerant grasses. The majority of these soils are currently used for grain crop production.

In a representative profile of Oliver soil the solum is approximately 60 cm thick. The profile is characterized by a very dark gray to black Ap or Ah horizon, 10 to 20 cm thick, a dark grayish brown Bn or Bnt horizon, 15 to 25 cm thick with very strong columnar to massive structure a very dark grayish brown transitional BC horizon, 10 to 15 cm thick and a yellowish brown C horizon with many distinct iron mottles. The parent material is typically saline at depth. A typical profile also contains gypsum crystals in the C horizon

Oliver soils were previously mapped as the dominant associate of the Oliver association in the reconnaissance soil survey of South-Central Manitoba (1943).

Ollneck Series (OLK)

The Ollneck series consists of imperfectly drained Gleyed Dark Gray Luvisol soil developed on moderately to strongly calcareous, deep, uniform, fine loamy to fine silty, slightly stony mixed till deposits. These soils occur in lower slope positions of moderate slopes on undulating to hummocky landscapes and have moderately slow permeability, slow surface runoff, and a medium water table during the growing season. Ollneck soils are non-eroded, slightly stony, and occassionally slightly saline. They have a high available water holding capacity, medium organic matter content, and medium natural fertility. Native vegetation includes aspen-oak groves, willows and prairie grasses. The majority of these soils are currently cultivated for crop production.

In a representative profile of Ollnesk soil the solum is approximately 55 cm thick. The profile is characterized by a dark gray Ah horizon, 5 to 10 cm thick, a light gray Ae horizon, 5 to 10 cm thick with platy structure, a brown Bt horizon, 15 to 25 cm thick with faint mottles and a yellowish brown Ck horizon, with many prominent mottles. A typical profile also contains a weakly developed lime accumulation layer.

Ollneck soils occur in close association with Pembina and Horose soils. They are similar to Zaplin soils by having an imperfectly drained profile in mixed till but differ from them in having a diagnostic Ae horizon. Ollneck soils were previously mapped as minor inclusions of Pembina in the soil survey of South-Central Manitoba (1943).

Onahan Series (ONH)

The Onahan series is a Gleyed Regosol soil developed on imperfectly drained, weakly to noncalcareous, sandy (FS, LS, S), eolian sediments. These soils occur in lower and midslope positions on complex hummocky topography in association with the Shilox series which is found on steeper slopes, and Mockry soils in associated depressions. Surface runoff is slow, and permeability is rapid, but can be restricted by a high water table in the spring and early summer. These soils have been stabilized for more than 60 years as indicated by tree growth. Some areas have been seeded to grasses and used for pasture.

The Onahan soil profile has a partially decomposed LH horizon, 1 to 3 cm thick, and a gray to dark gray Ah horizon, 5 to 18 cm thick. The Cgj horizon is pale brown with strong brown to yellowish brown mottles. This profile differs from the somewhat similar Hummerston soil series, in not having a Chernozemic A horizon.

Onahan soils were included in duned landscape areas of the Stockton Association in the Carberry (1957) soil report.

Pembina Series (PBI)

The Pembina series consists of moderately well to well drained Dark Gray Luvisol soil developed on moderately to very strongly calcareous, deep, uniform, loamy, mixed till deposits. These soils occur in middle to upper positions of moderate to strong slopes on hummocky landscape and have moderate permeability rapid surface runoff and a low water table during the growing season. Pembina soils are moderately to severely eroded in upper slope positions, slightly stony and non-saline. They have high available water holding capacity, moderate organic matter content and moderate natural fertility.

In a representative profile of Pembina soil the solum is approximately 50 cm thick. The profile is characterized by a dark grayish brown Ah or Ap horizon, 15 to 20 cm thick, a light gray Ae horizon, 5 to 8 cm thick with platy structure, a brown to pale brown, clay loam to silty clay textured Bt horizon 15 to 30 cm thick and a white Cca horizon of lime accumulation.

Pembina soils occur in close association with Dezwood, Vandal and Firdale soils. They are similar to Poyser soils by having a luvisolic profile developed in mixed till but differ from them because of an Ah or Ahe horizon more than 5 cm thick in undisturbed profiles. Pembina soils were previously mapped as the well drained, dominant associates of the Pembina association in the reconnaissance soil survey of South-Central Manitoba (1943).

Perillo Series (PBR)

The Perillo series consists of very poorly drained Terric Mesisol soil developed on a mantle (40 to 160 cm) of moderately decomposed organic material composed of fen peat over moderately to strongly calcareous, deep, uniform, coarse loamy (L, SiL, VFSL), lacustrine deposits. These soils occur in depressional positions of nearly level slopes on rolling to hummocky landscapes and have slow permeability very slow surface runoff and a very high water table during the growing season. Perillo soils are occasionally slightly saline. They have a high available water holding capacity, very high organic matter content, and low natural fertility. Native vegetation often includes sedges, reeds, and clumps of willow or swamp birch. The majority of these soils are currently used for natural grazing.

In a representative profile of Perillo soil the solum is approximately 50 cm thick. The profile is characterized by a black Om horizon, 5 to 15 cm thick, a black Oh horizon, 20 to 45 cm thick, a black Ah horizon, 15 to 25 cm thick, with a few large iron mottles and a light brownish gray AC horizon 10 to 25 cm thick, with many large prominent iron mottles. The mineral soil parent material is typically light gray in color with numerous prominent mottles and manganese concretions. A typical profile also contains snail shells on the surface and throughout the profile.

Perillo soils occur in association with sloughs, lakes and areas of restricted drainage. They are similar to Tadpole peaty phase soils but differ from them in having an organic surface horizon greater than 40 cm thick to the mineral soil substrate. Perillo soils were previously mapped as meadow or marsh inclusions of many soil associates in the reconnaissance soil survey of South-Central Manitoba (1943).

Petrel Series (PTR)

The Petrel series consists of imperfectly drained Gleyed Black soil developed on a mantle (25 to 75 cm) of moderately to strongly calcareous, shallow, loamy (VFSL,L,SiL), deposits over moderately calcareous, uniform, deep, sandy (FS,LFS,LS), lacustrine and fluvial deposits. These soils occur in middle positions of very gentle slopes on undulating landscapes and have moderate over moderately rapid permeability, moderately slow surface runoff, and a high water table during the growing season. Petrel soils are non-eroded, non-stony, and occasionally slightly saline. They have a medium available water holding capacity, medium organic matter content, and medium natural fertility. Native vegetation includes prairie grasses, shrubs, aspen and oak. The majority of these soils are currently cultivated for crop production.

In a representative profile of Petrel soil the solum is approximately 40 cm thick. The profile is characterized by a very dark gray Ah horizon, 18 to 25 cm thick, a brown Bm horizon, 14 to 20 cm thick, a BC horizon, 20 to 30 cm thick with faint mottles and a light yellowish brown Ck horizon, with yellowish brown to strong brown mottles. A typical profile also contains a weak Cca in the upper part of the sandy substrate.

Petrel soils occur in close association with Glenboro, Grover and Grayson soils. They are similar to Torcan soils by having imperfect drainage and a loamy surface but differ from them in having a sandy substrate.

Poplar Point Series (PPR)

The Poplar Point series consists of imperfectly drained Gleyed Cumulic Regosol soil developed on weakly to moderately calcareous, deep, stratified loamy (SiL,L,SiCL,CL), recent fluvial deposits. These soils occur in middle positions of very gentle slopes on flood prone terrace, levee and meander landscapes and have moderate permeability, slow surface runoff, and a high water table during the growing season. Poplar Point soils are slightly water eroded, nonstony, and often slightly saline. They have a medium available water holding capacity, medium organic matter content, and medium natural fertility. Native vegetation includes deciduous trees and prairie grasses. The majority of these soils are currently cultivated for crop production.

In a representative profile of Poplar Point soil the solum is not developed. The profile is characterized by a very weak Ah or Ap horizon, 10 to 20 cm thick, and a slightly lighter Ck horizon with distinct iron mottles.

Poplar Point soils occur in close association with Elm River and Willowbend soils. They are similar to Gervais soils by having Gleyed Cumulic Regosol soil in loamy alluvium but differ from them in having no distinct A horizon. Poplar Point soils were previously mapped as inclusions of the Riverdale Association in the Carberry (1957) soil report.

Prodan Series (PDA)

The Prodan series is a Gleyed Rego Black, carbonated soil developed on imperfectly drained, strongly to very strongly calcareous, fine loamy (CL, SiCL), lacustrine sediments. These soils occur in the Upper Assiniboine Delta and Brandon Lakes Plain on gently sloping topography in association with Ramada, Charman, Carroll and Tadpole soils. Surface runoff is moderately slow, and permeability is moderate to moderately slow. A seasonal water table frequently occurs within 70 cm of the surface.

The Prodan soil profile has a very dark gray Ah horizon, 18 to 25 cm thick; a dark gray to gray ACk horizon, 8 to 15 cm thick, and a Cca horizon. The Ckgj horizon is light brownish gray with yellowish brown mottles. This soil differs from the similar Charman series in not having a prominent Bmgj horizon. Prodan soils are finer textured and less permeable than the similar loamy textured Taggart and Torcan soils. The very similar Capell soils have coarse, sandy and gravelly textured subsoils that are very rapidly permeable.

Prodan soils were previously mapped as Black Meadow associates of the Holland Association in the reconnaissance soil survey of South-Central Manitoba (1943).

Ramada Series (RAM)

The Ramada series is an Orthic Black soil developed on well to moderately well drained, strongly to very strongly calcareous, fine loamy (CL, SiCL), lacustrine sediments. These soils occur in the Upper Assiniboine Delta, and Brandon Lakes Plain on very gently sloping topography or on mid and upper slope positions of undulating topography associated with Barren, Carroll, Charman, Prodan and Tadpole soils. Surface runoff is moderately rapid, and permeability is moderate to moderately slow.

The Ramada soil profile has a very dark gray Ah horizon, 10 to 20 cm thick; a dark grayish brown to brown Bm horizon, 8 to 12 cm thick, and a BCk horizon, 6 to 10 cm thick. A Cca horizon is usually present. The Ck horizon is pale brown to light yellowish brown. This soil differs slightly from the Carroll soil in having a prominent Bm horizon. Ramada soils are finer textured and less permeable than the similar coarser textured, loamy Fairland soils, as well as, the Croyon and Zarnet soils which have coarse sandy and gravelly textured subsurface layers and very rapid permeability.

Ramada soils were previously mapped as the dominant associate of the Holland Association in the reconnaissance soil survey of South-Central Manitoba (1943).

Rempel Series (RMP)

The Rempel series consists of moderately well to well drained Calcareous Black soil developed on strongly to very strongly calcareous, deep, uniform, fine loamy (CL,SiCL), lacustrine deposits. These soils occur in upper positions of gentle slopes on undulating landscapes and have moderate permeability, moderately rapid surface runoff, and a low water table during the growing season. Rempel soils are occasionally slightly eroded, non-stony, and non-saline. They have a medium available water holding capacity, medium organic matter content, and high natural fertility. Native vegetation includes tall prairie grasses, meadow grasses and aspen-oak groves. The majority of these soils are currently cultivated for crop production.

In a representative profile of Rempel soil the solum is approximately 20 cm thick. The profile is characterized by a very dark gray to very dark grayish brown Ah horizon, 15 to 22 cm thick, with weak calcareousness, a dark grayish brown to brown Bmk horizon, 10 to 15 cm thick, a pale brown BC horizon, 5 to 10 cm thick with moderate calcareous and a light gray to white Cca horizon, 10 to 15 cm thick with lime accumulation.

Rempel soils occur in close association with Ramada, Prodan and Tadpole soils. They are similar to Ramada soils by having well drained, fine loamy soils but differ from them in having a Bmk rather than Bm horizon. Rempel soils were previously mapped as Blackearth associate of the Holland Association in the Carberry (1957) soil report.

Sewell Series (SEE)

The Sewell series consists of poorly drained Rego Humic Gleysol soil developed on weakly to moderately calcareous, deep, uniform, sandy (FS,LFs,LS), lacustrine and fluvial deposits. These soils occur in depressional positions of gentle slopes on hummocky landscapes and have moderately rapid permeability, very slow surface runoff, and a high to ponded water table during the growing season. Sewell soils are non-eroded, non-stony, and often slightly saline. They have a low available water holding capacity, high organic matter content, and low natural fertility. Native vegetation includes sedges, rushes, reeds and willows. The majority of these soils are currently in native vegetation.

In a representative profile of Sewell soil the solum is approximately 15 cm thick. The profile is characterized by moderately decomposed organic horizon, 2 to 5 cm thick, a very dark gray Ah horizon, 10 to 18 cm thick, a dark gray to gray AC horizon, 10 to 15 cm thick with carbonates and mottles, and usually a Cca horizon, 5 to 8 cm thick. A typical profile also contains an olive to pale olive Ck horizon with yellowish brown mottles and manganese concretions.

Sewell soils occur in close association with Stockton, Lavenham and Hummerston soils. They are similar to Osterwick soils by having poor drainage and a Rego Humic Gleysol profile but differ from them in having sandy rather than coarse loamy deposits. Sewell soils were previously mapped as Meadow associates of the Stockton Association in the Carberry (1957) soil report.

Sigmund Series (SGO)

The Sigmund series consists of imperfectly drained Gleyed Rego Black soil developed on moderately to strongly calcareous, deep, uniform clayey (SiC, C), lacustrine deposits. These soils occur in lower slope positions of very gentle slopes on undulating landscapes and have slow permeability, moderately slow surface runoff, and a high water table during the growing season. Sigmund soils are non-eroded, non-stony, and frequently slightly saline. They have a high available water holding capacity, medium organic matter content, and medium natural fertility. Native vegetation includes aspen-oak groves, well and prairie grasses. The majority of these soils are currently under cultivation for grain crops.

In a representative profile of Sigmund soil the solum is approximately 20 cm thick. The profile is characterized by very dark gray Ah horizon, 15 to 25 cm thick, a dark gray AC horizon, 5 to 18 cm thick with many faint mottles, a light gray Cca horizon, 5 to 15 cm thick with many prominent mottles and a light olive brown C horizon, with many prominent mottles. A typical profile also contains gypsum crystals in the subsoil.

Sigmund soils occur in close association with Janick, Harding and Lowton soils. They are similar to Harding soils by having an imperfectly drained profile in clayey deposits but differ from them in having no B horizon diagnostic of the Harding soils. Sigmond soils were previously mapped as minor inclusions of the Oliver Association in the soil survey of South-Central Manitoba (1943).

Shellmouth Complex (SEU)

The Shellmouth Complex consists of well to excessively drained Orthic Regosol soil developed on variable textured deposits. These soils occur in crest to lower positions of very strong to extreme slopes on river and streambank landscapes and have variable permeability, rapid surface runoff, and a low water table during the growing season. Shellmouth soils are actively severely eroded, non-stony, and non-saline. They have variable available water holding capacity, low organic matter content, and low natural fertility. Native vegetation includes forests of aspen, oak and willow. The majority of these soils are currently too steep to be cultivated. In a representative profile of Shellmouth soil the solum is not developed. The profile is characterized by a very thin LF horizon, 1 to 3 cm thick, with leaf litter and a Ck horizon.

Shellmouth soils occur in close association with alluvial soils along stream banks. Shellmouth soils were previously mapped as Eroded Slopes (ERX) in the Carberry (1957) soil report.

Shilox Series (SHX)

The Shilox series consists of moderately well to excessively drained Orthic Regosol soil developed on weakly to noncalcareous, deep, uniform, sandy (FS,LS,S), eolian deposits. These soils occur in middle and upper positions of moderate to strong slopes on hummocky to duned landscapes and have rapid to very rapid permeability, very slow surface runoff, and a low water table during the growing season. Shilox soils are severely wind eroded, non-stony, and non-saline. They have low available water holding capacity, low organic matter content, and low natural fertility. Native vegetation includes oak black spruce, juniper and prairie grasses. The majority of these soils are currently wooded.

In a representative profile of Shilox soil the solum is not developed. The profile is characterized by a partially decomposed LH horizon, 1 to 2 cm thick, a grayish brown to pale brown Ah horizon, 6 to 10 cm thick, and a light yellowish brown to pale brown C horizon. A typical profile also contains an occasional buried Ah horizon, 2 to 4 cm thick.

Shilox soils occur in close association with Onahan and Mockry soils. They are similar to Arizona soils by having a Regosol profile in sandy deposits but differ from them in having less stratification and more uniform textures. Shilox soils were previously mapped as duned associates of the Stockton Association in the Carberry (1957) soil report.

Sutton Series (SXP)

The Sutton series consists of poorly drained Rego Humic Gleysol soil developed on a mantle (25 to 100 cm) of moderately calcareous, fine loamy (CL, SCL), lacustrine deposits over moderately calcareous, deep, stratified, sandy (FS, LFS, LS), fluvial lacustrine deposits. These soils occur in depressional positions of negligible slopes on level landscapes and have restricted permeability, negligible surface runoff, and a near surface water table during the growing season. Sutton soils are non-eroded, non-stony, and frequently weakly saline. They have a moderate available water holding capacity, high organic matter content, and low natural fertility. Native vegetation includes sedges hydrophytic grasses and willows. The majority of these soils are currently in native vegetation.

In a representative profile of Sutton soil the solum is approximately 20 cm thick. The profile is characterized by a moderately decomposed organic horizon, 2 to 4 cm thick, a very dark gray Ah horizon, 10 to 18 cm thick, a dark gray AC horizon, 4 to 8 cm thick with carbonates and a light gray Cca horizon, 5 to 8 cm thick with many distinct mottles. The parent material is typically olive brown in colour with many prominent mottles. A typical profile also contains gypsum crystals at depth.

Sutton soils occur in close association with Wellwood soils. They are similar to Tadpole soils by having poorly drained profile and a fine loamy surface but differ from them in having sandy substrate while Tadpole soils are fine loamy throughout. Sutton soils were previously mapped as poorly drained associates of the Wellwood Association in the soil survey of South-Central Manitoba (1943).

Tadpole Series (TDP)

The Tadpole series is a Rego Humic Gleysol, developed on poorly drained, strongly to very strongly calcareous, fine loamy (CL, SiCL), lacustrine sediments. These soils occur in level to depressional positions of gently sloping to undulating topography in association with Carroll, Firdale, Charman and Danlin soils. Surface runoff is very slow and permeability is restricted. Free water occurs at or near the surface for a considerable part of the year. In areas where seepage water contains appreciable soluble salt, a sufficient salt accumulation can occur to inhibit or retard the growth of normal hydrophytic vegetation.

The Tadpole soil profile has a moderately decomposed organic layer, 2 to 6 cm thick; a very dark gray Ah horizon, 10 to 18 cm thick; a dark gray ACk horizon, 4 to 6 cm thick; a Ccag horizon, 10 to 15 cm thick, and an olive to olive gray Ckg horizon with distinct yellowish brown mottles. In areas affected by salts, white pseudomycelia are common in the surface horizons. Tadpole soils are finer textured and less permeable than the very similar and increasingly more coarse textured Vordas, Poolex and sandy Mockry and Sewell soils. The similar Carvey soils have coarser textured sandy to gravelly subsurface layers that are much more rapidly permeable than the Tadpole soils.

Taggart Series (TGR)

The Taggart series consists of imperfectly drained Gleyed Rego Black soil developed on strongly to very strongly calcareous, deep, uniform, loamy (VFSL,L,SiL), lacustrine deposits. These soils occur in middle positions of gentle to very gentle slopes on undulating landscapes and have moderate permeability, slow surface runoff, and a high water table during the growing season. Taggart soils are non-eroded, non-stony, and often slightly saline. They have a medium available water holding capacity, medium organic matter content, and medium natural fertility. Native vegetation includes aspen, oak, willow and prairie grasses. The majority of these soils are currently cultivated for crop production.

In a representative profile of Taggart soil the solum is approximately 20 cm thick. The profile is characterized by a very dark gray Ah horizon, 15 to 24 cm thick, a dark gray AC horizon, 5 to 15 cm thick with moderate calcareousness, a Cca horizon, 8 to 12 cm thick with lime carbonates and an olive brown Ck horizon, with yellowish brown mottles. A typical profile also contains gypsum crystals below the Cca horizon.

Taggart soils occur in close association with Fairland, Durnan and Vordas soils. They are similar to Torcan soils by having imperfect drainage and loamy deposits but differ from them in having no prominent Bm horizon. Taggart soils were previously mapped as imperfectly drained associates of the Holland Association in the Carberry (1957) soil report.

Tellier Series (TLI)

The Tellier series consists of imperfectly drained Gleyed Dark Gray soil developed on a mantle (25 to 100 cm) of moderately to strongly calcareous, uniform, fine loamy (L, CL, SICL), lacustrine deposits over moderately to strongly calcareous, deep, uniform fine loamy (CL, L, SICL) mixed till deposits. These soils occur in lower slope positions of very gentle slopes on undulating landscapes and have moderate permeability, moderate surface runoff and a medium water table during the growing season. Tellier soils have medium available water holding capacity, medium organic matter content, and medium natural fertility. Native vegetation often includes tall prairie and meadow grasses. The majority of these soils are currently used for grain crop production.

In a representative profile of Tellier soil the solum is approximately 45 cm thick. The profile is characterized by dark gray Ap or Ah horizon, 10 to 20 cm thick, a very dark brown Bt or Btj horizon, 20 to 30 cm thick with a few fine faint iron mottles, a grayish brown, carbonated, transitional IIBC horizon, 10 to 15 cm thick and a dark yellowish brown IICk horizon with common, distinct, fine iron mottles.

Tellier soils occur in close association with Altamont and Narish soils. Tellier soils were previously mapped as minor imperfectly drained associates of the Altamont association in the reconnaissance soil survey of South-Central Manitoba (1943).

Torcan Series (TOC)

The Torcan series consists of imperfectly drained Gleyed Black soil developed on strongly to very strongly calcareous, deep, uniform, loamy (VFSL,L,SiL), lacustrine deposits. These soils occur in middle to lower positions of very gentle slopes on rolling to undulating landscapes and have moderate permeability, moderately slow surface runoff, and a medium water table during the growing season. Torcan soils are non-eroded, non-stony, and occasionally slightly saline. They have a medium available water holding capacity, medium organic matter content, and high natural fertility. Native vegetation includes aspen, willow, shrubs and meadow grasses. The majority of these soils are currently cultivated for grain crop production.

In a representative profile of Torcan soil the solum is approximately 45 cm thick. The profile is characterized by a very dark gray Ah horizon 18 to 25 cm thick, a light brown Bm horizon, 10 to 18 cm thick with yellowish brown mottles, a Cca horizon, 8 to 12 cm thick, and a light olive brown Ck horizon, with yellowish brown mottles.

Torcan soils occur in close association with Fairland, Taggart and Vordas soils. They are similar to Taggart soils by having imperfect drainage and loamy deposits but differ from them in having a prominent Bm horizon. Torcan soils were previously mapped as associates of the Holland Association in the Carberry (1957) soil report.

Ullrich Series (ULH)

The Ullrich series consists of imperfectly drained Gleyed Black soil developed on a mantle (25 to 100cm) of moderately to a strongly calcareous, uniform, fine loamy (L,CL,SiCL), lacustrine deposits over moderately to strongly calcareous, deep, uniform, fine loamy (L,CL), mixed till deposits. These soils occur in middle to lower slope positions of very gentle slopes on undulating landscapes and have moderate permeability moderately slow surface runoff and a medium water table during the growing season. Ullrich soils have medium available water holding capacity, medium organic matter content, and medium natural fertility. Native vegetation often includes tall prairie grasses interspersed by aspen-oak groves. The majority of these soils are currently used for grain crop production.

In a representative profile of Ullrich soil the solum is approximately 35 cm thick. The profile is characterized by black to very dark gray Ap or Ah horizon, 10 to 20 cm thick, a very dark brown Bm horizon, 10 to 20 cm thick with fine, faint iron mottles, a transitional dark brown IIBC horizon, 5 to 10 cm thick and a grayish brown IICk horizon with common distinct, iron mottles.

Ullrich soils occur in close association with Knudson, Joyale and Guerra soils. They are similar to Nikkel soils by having an imperfectly drained Gleyed Black profile and a fine loamy till substrate. However, they differ from Nikkel soils in having a loamy textured lacustrine mantle overlying glacial till. Ullrich soils were previously mapped as imperfectly drained associates of the Altamont association in the reconnaissance soil survey of South-Central Manitoba (1943).

Vandal Series (VDL)

The Vandal series consists of well drained Orthic Dark Gray soil developed on a mantle (30 to 100cm) of moderately to strongly calcareous, thin stratified, coarse-loamy (SiL, L, SL), lacustrine deposits over moderately to strongly calcareous, deep, stratified, sandy skeletal (GrS, LGrS) glaciofluvial deposits. These soils occur in middle and upper positions of very gentle to moderate slopes on hummocky landscapes and have moderate over rapid permeability moderate surface runoff and a low water table during the growing season. Vandal soils have low available water holding capacity, medium organic matter content, and medium natural fertility. Native vegetation often includes tall prairie grasses aspen popular and scrub oak. The majority of these soils are currently used for mixed farming but where gravel deposits are sufficiently deep they have been mined as a source for gravel.

In a representative profile of Vandal soil the solum is approximately 45 cm thick. The profile is characterized by a very dark grayish brown Ap or Ah horizon, 10 to 18 cm thick, a grayish brown Bt or Btj horizon, 20 to 35 cm thick, a yellowish brown IICca horizon, 10 to 20 cm thick with numerous coarse fragments and a brown to light brown IICk horizon with mixed shale, limestone and granite gravel. The parent material is typically stratified with very gravelly and coarse sand layers (8 to 10 cm). A typical profile also contains thin (<2 cm) lenses of silt loam to very fine sandy loam at depth.

Vandal soils occur in close association with Firdale, Vartel and Carvey soils. They are similar to Altamont soils by having an Orthic Dark Gray profile developed mostly in loamy and fine silty deposits but differ from them in having a sandy and gravelly substrate rather than a fine loamy glacial till substrate. Vandal soils were previously mapped as a minor associate of the Heaslip complex in the reconnaissance soil survey of South-Central Manitoba (1943).

Vandal Series, shale gravel substrate variant (VDL1)

The Vandal series shale gravel substrate variant, occurs in close association with Vandal soils and differ from them in having dominantly shale derived coarse fragments in the sandy-skeletal substrate.

Vartel Series (VTL)

The Vartel series consists of imperfectly drained Gleyed Dark Gray soil developed on a mantle (25 to 100 cm) of moderately to strongly calcareous, stratified, loamy (SIL, L, SL), lacustrine deposits over moderately to strongly calcareous, stratified, deep sandy-skeletal (GrS, LGrS), glaciofluvial deposits. These soils occur in lower slope positions of very gentle to moderate slopes on hummocky landscapes and have moderate over rapid permeability, moderately slow surface runoff and a medium water table during the growing season. Vartel soils are non-eroded, nonstony and occasionally slightly saline. They have medium available water holding capacity, medium organic matter content, and medium natural fertility. Native vegetation often includes tall prairie and meadow grasses. The majority of these soils are currently used for grain crop production.

In a representative profile of Vartel soil the solum is approximately 50 cm thick. The profile is characterized by a dark gray Ap or Ah horizon, 10 to 20 cm thick, a brown to olive brown Bt or Btj horizon, 15 to 30 cm thick with many, fine, faint iron mottles, an olive brown IIBC horizon, 5 to 15 cm thick with faint iron mottles and a dark yellowish brown IICk horizon with large, distinct iron mottles. The parent material is typically mixed gravel of limestone, granite and shale origin. A typical profile also contains thin strata of L, VFSL and SiL interspersed with gravelly layers.

Vartel soils occur in close association with Vandal and Carvey soils. They are similar to Tellier soils by having a Gleyed Dark Gray profile developed in fine loamy lacustrine deposits but differ from them in having a sandy-skeletal glaciofluvial substrate rather than a fine loamy glacial till substrate. Vartel soils were previously mapped as imperfectly drained associates of the Leary association and Heaslip complex in the reconnaissance soil survey of South-Central Manitoba (1943).

Vartel Series, shale gravel substrate variant (VTL1)

The Vartel series shale gravel substrate variant, occurs in close association with typical Vartel soils and differs in having dominantly shale derived coarse fragments in the sandy-skeletal substrate.

Vordas Series (VDS)

The Vordas series consists of poorly drained Rego Humic Gleysol soil developed on strongly to very strongly calcareous, deep, uniform, loamy (VFSL,SiL,L), lacustrine deposits. These soils occur in level to depressional positions of very gentle slopes on undulating landscapes and have moderate permeability, very slow surface runoff, and a high to ponded water table during the growing season. Vordas soils are non-eroded, non-stony, and often slightly saline. They have a medium available water holding capacity, high organic matter content, and low natural fertility. Native vegetation includes sedges, rushes, reeds and willows. The majority of these soils are currently in native vegetation.

In a representative profile of Vordas soil the solum is approximately 15 cm thick. The profile is characterized by a moderately decomposed organic horizon, 2 to 5 cm thick, a very dark gray Ah horizon, 10 to 18 cm thick, a dark gray AC horizon, 4 to 6 cm thick with carbonates and mottles, and an olive to pale olive Ck horizon, with yellowish brown iron mottles. A typical profile also contains white pseudomycelia of salt in the Ah and AC horizons in saline areas.

Vordas soils occur in close association with Fairland, Taggart and Torcan soils. They are similar to Tadpole soils by having poor drainage and loamy deposits but differ from them in having slightly coarser textures. Vordas soils were previously mapped as Meadow associates of the Holland Association in the Carberry (1957) soil report.

Wellwood Series (WWD)

The Wellwood series consists of well to moderately well drained Orthic Black soils developed on a thin mantle (25 to 75 cm) of strongly calcareous fine loamy (CL-SiCL) sediments grading to moderately calcareous sandy (FS, LFS, LS) deposits. Topography is very gently to gently sloping; runoff is moderate to moderately slow; permeability is moderate in the upper loamy strata and rapid in the sandy strata.

The soil is characterized by a deep black to very dark gray Ah horizon, 18 to 30 cm thick; a dark brown to brown, prismatic to subangular blocky Bm horizon, 16 to 24 cm thick, and a yellowish brown to pale brown BC horizon, 8 to 14 cm thick. A weak lime accumulation may be present.

Willowbend Series (WWB)

The Willowbend series consists of poorly drained Rego Humic Gleysol soil developed on moderately to strongly calcareous, stratified, deep, loamy (FSL,SL,L,SiL,CL,SiCL), recent alluvial deposits. Strata can vary in texture from FS to CL depending on source area and position relative to stream channels. These soils occur in level to depressional positions of very gentle slopes on flood prone terraces and meander landscapes and have moderately slow permeability, very slow surface runoff, and a high to ponded water table during the growing season. Willowbend soils are non-eroded, non-stony, and often moderately saline. They have a medium available water holding capacity, medium organic matter content, and low natural fertility. Native vegetation includes sedges, rushes, reeds and willows. The majority of these soils are currently in native vegetation.

In a representative profile of Willowbend soil the solum is not developed. The profile is characterized by a moderately decomposed LH horizon, 5 to 10 cm thick, a very dark gray Ah horizon, 15 to 20 cm thick with moderate calcareousness, and a light brownish gray to very pale brown Ck horizon with many prominent mottles. Buried Ah horizons often occur throughout the soil profile.

Willowbend soils occur in close association with La Salle and Gervais soils. They are similar to Basker soils by having stratified loamy alluvium and poor drainage but differ from them by occurring in a warmer soil climate. Willowbend soils were previously mapped as inclusions of the Riverdale Association in the Carberry (1957) soil rpeort.

Winkler Series (WIK)

The Winkler series consists of moderately well drained Orthic Black soil developed on moderately calcareous, deep, stratified, clayey (SiC,C), lacustrine deposits. These soils occur in middle positions of very gentle slopes on undulating landscapes and have moderately slow permeability, moderately slow surface runoff, and a high water table during the growing season. Winkler soils are non-eroded, non-stony, and occasionally slightly saline. They have a high available water holding capacity, high organic matter content, and medium natural fertility. Native vegetation includes tall prairie grasses, shrubs and aspen-oak groves. The majority of these soils are currently cultivated for grain crop production.

In a representative profile of Winkler soil the solum is approximately 45 cm thick. The profile is characterized by a very dark gray Ah horizon, 13 to 25 cm thick, a dark brown Bm horizon, 20 to 35 cm thick with moderate medium granular to prismatic structure, and a Ck horizon, with dominantly SiC to C textures. The parent material is typically stratified with lighter textures at depth.

Winkler soils occur in close association with Dead Horse and Plum Coulee soils. They are similar to Denham soils by having an Orthic Black profile and clayey substrate but differ from them in having no loamy surface mantle. Winkler soils were previously mapped as Blackearth associates of the Rathwell Association in the Carberry (1957) soil report.

Winkler, heavy clay variant (WIK2)

The Winkler, heavy clay variant is characterized by an Orthic Black solum, moderately well to well soil drainage, and materials of fine to very fine clayey fluvial and lacustrine sediments. They occur in association with the Gretna soils and may appear as a Solonetzic Black in some areas. These soils are found in the lower slopes of the Escarpment and western parts of the Red River Plain. Topography is very gently sloping; runoff is moderate. Permeability is slow to very slow. The subsoils can have some gypsum crystals and other soluble salts.

The Winkler, heavy clay variant differs from the Winkler series because of the increased clay content throughtout the profile. The former has a clay content ranging from 55 to 85 percent while the normal Winkler series have clay contents commonly between 40 to 50 percent with some strata of silty textures in the subsoil.

Xavier Series (XVI)

The Xavier series consists of very poorly drained Typic Mesisol soil developed on deep (>160 cm), moderately decomposed, mesic fen peat deposits. These soils occur in depressional positions of level slopes on level landscapes and have moderately slow permeability, very slow surface runoff, and a high to ponded water table during the growing season. Xavier soils are non-eroded, non-stony, and non-saline. They have a high available water holding capacity, high organic matter content, and medium natural fertility. Native vegetation includes sedges, rushes, reeds and willow. The majority of these soils are currently in native vegetation.

Xavier soil is characterized by a dark yellowish brown Of horizon, 10 to 30 cm thick, which is medium acid to neutral and a thick, very dark brown, medium acid to neutral Om horizon, grading into a black, weakly acid to weakly calcareous Oh horizon. Underlying mineral strata range in texture from loam to clay.

Xavier soils are similar to Perillo soils by having very poor drainage and organic deposits but differ from them in having deep (>160 cm) rather than shallow (40-160 cm) organic deposits.

PART 2

SOIL SUITABILITY OR PERFORMANCE INTERPRETATIONS

Tables 5 through 7 provide predictions of performance in terms of suitability ratings for various uses of soils based on field observations, laboratory data and on observations of soil behavior under specified conditions of land use and management. Interpreted suitability ratings are intended to serve only as guides for planners and managers. The soil map does not portray site specific information. Rather it conveys information on soil properties and land surface conditions most likely to be encountered in the delineated area. Therefore, interpretations should be considered general in nature and as estimates of the potential or limitations of an entire map delineation for an intended use.

Caution, with an understanding of the limitations of the soil map must be exercised when applying suitability ratings to soil map units. The value of any interpretive rating depends on the scale of mapping and intensity of ground truthing employed in the survey. For the reason any significant adjustments to scale (enlargement or reduction) may lead to a misunderstanding of the detail and reliability of the mapping and subsequent interpretations.

In this section, interpretive soil information is provided for the following land use evaluations:

1. Agriculture
    a) dryland farming capability
    b) irrigation suitability
2. Engineering Uses
3. Recreation Uses

Soil capability classification for dryland agriculture is based on an evaluation of both internal and external soil characteristis that influence soil suitability and limitations for agricultural use. In this classification, mineral soils are grouped into capability classes, and subclasses based on their limitations for dryland farming, risk of damage when the soils are used and the way they respond to management. There are seven capability classes, each of which groups soils together that have the same relative degree of limitation or hazard for agricultural use. The limitation becomes progressively greater from Class 1 to Class 7. (Table 3).

Soil Capability subclasses are divisions within classes which group soils with similar kinds of limitations and hazards for agricultural use. The various kinds of limitations recognized at the subclass level are defined in Table 4.

Organic soils within the map area are rated for "potential" agricultural capability[7]. Capability ratings of organic soils for agricultura must recognize that most organic soils have little or no value for agriculture in their native state and their potential is only achieved through reclamation or development implemented with varying degrees of difficulty. Capability class definitions for organic soils are the same as for mineral soils. They are however, identified on maps and tables with the prefix "O".

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[7] Leeson et. al. 1969. An Organic Soil Capability Classification for Agriculture and a Study of the Organic Soils of Simcoe County. Soil

Irrigation suitability of soils is determined by evaluating the nature of both internal and external soil characteristics[8].

The *suitability class* groups soils having the same relative suitability or degree of limitation or hazard for irrigation use. Four classes are utilized grading from Class 1, which is very good to Class 4, which is poor (Table 3).

The *suitability subclass* identifies soils with similar kinds of limitations and hazards related to both internal and external soil characteristics (Table 4). The internal characteristics include both permanent and non-permanent properties; the permanent properties are those that will not change over time whereas the non-permanent properties may be altered with time by specific management.

Evaluation of soil suitability for engineering[9] and recreation[10] uses is based on both internal and external soil characteristics. Four soil suitability classes are used to evaluate both mineral and organic soils and hence, mapping units for selected uses. These ratings express relative degrees of suitability or limitation for potential uses of natural or essentially undisturbed soils. The long term effects of the potential use on the behavior of the soil are considered in the rating.

The basic soil properties that singly or in combination with others commonly affect soil suitability for selected engineering properties and recreation uses are provided in Table 4. These subclass designations serve to identify the kind of limitation or hazard for a particular use.

Sci. Dept., Ont. Agricultural College, Guelph.

[8] PFRA. 1964. *Handbook of the Classification of Irrigated Land in the Prairie Provinces*. PFRA, Regina, Sask.

[9] U.S.D.A. 1971. *Guide for Interpreting Engineering Uses of Soils*. Soil Conservation Service. U.S.D.A. SCS-45.

[10] Coen et. al 1977. *Soil Survey of Yoho National Park, Canada*. Alberta. Soil Survey Rept. No. 37, Alberta. Ins. of Pedology, University of Alberta, Edmonton, Alberta.

TABLE 3

Ratings or Potential of Soils for Various Land Use Applications

Land Use Evaluation	Rating	Explanation
Dryland Agriculture[1]	Class 1	no limitations to agriculture
	2	moderate soil limitations
	3	moderate limitations, crops restricted
	4	severe limitations, marginal for crops
	5	only suitable for improved pasture
	6	only suitable for native pasture
	7	no capability for agriculture
Irrigation Suitability[2]	Class 1	very good, suited for irrigation
	2	good, moderately well suited
	3	fair, marginally suited
	4	poorly suitable for irrigation
Engineering Uses[3]	Class G	good, minor limitation
	F	fair, 1 or more moderate limitations
	P	poor, 1 or more severe limitations
	VP	very poor, economically impractical
Recreational Uses[4]	Class G	good, suitable for recreational uses
	F	fair, 1 or more moderate limitations
	P	poor, 1 or more severe limitations
	VP	very poor, unsuitable

1. Anon (1965). Land Capability Classification for Agriculture. Rep. No. 2, Canada Dept. Regional Economic Expansion, Ottawa. 16 pp.
2. PFRA (1964). Handbook for the Classification of Irrigated Land in the Prairie Provinces, PFRA, Regina, Sask.
3. U.S.D.A. (1971). Guide for Interpreting Engineering Uses of Soils. Soil Conservation Service. USDA. SCS-45. 87 pp.
4. Coen et. al. 1977). Soil Survey of Yoho National Park, Canada, Alberta. Soil Survey Report No. 37, Alberta.
Institute of Pedology, University of Alberta, Edmonton, Alberta.

TABLE 4

Agricultural Capability Subclass Limitations and Codes to Limitations in Engineering and Recreational Suitability Ratings. Land Classification Standards for Irrigation Suitability

1. Agricultural Capability Subclass Limitations

C	adverse climate
D	undesirable soil structure/ low permeability
E	erosion
F	low fertility
I	inundation
L	coarse wood fragments
M	moisture limitation
N	salinity
P	stoniness
R	bedrock
T	topography
W	excess water
X	cumulative minor adverse characteristics

2. Codes identify limitations for Engineering and Recreational Use Ratings

a	subgrade properties
b	thickness of topsoil
c	coarse fragment on surface
d	depth to bedrock
e	erosion or erodibility
f	susceptibility to frost hazard
g	contamination hazard of groundwater
h	depth to seasonal water table
i	flooding or inundation
j	thickness of slowly permeable material
k	permeability or hydraulic conductivity
l	shrink-swell properties
m	moisture limitations or deficit
n	salinity or sulphate hazard
o	organic matter
p	stoniness and or gravel
q	depth to sand or gravel
r	rockiness
s	surface texture
t	topographic slope class
u	moist consistence
w	wetness or soil drainage class
z	permafrost

3. Land Classification Standards for Irrigation Suitability

S	soils (texture, water holding capacity, geological deposit and salinity)
T	external features (stones, topography)
D	drainage (restricted outlet, water table)

TABLE 5. AGRICULTURE CAPABILITY CLASSES FOR SOILS

Map Symbol and Phase	Soil Name	Agricultural Capability Class	Irrigation Suitability
AIZ	Arizona	4M	4S
ASB	Assiniboine	2I	3SD
ATN	Altamont	1	3S
ATN /xcxx	Altamont	2T	3S
ATN /xdxx	Altamont	3T	3ST
ATN /xd1x	Altamont	3T	3ST
ATN /1d1x	Altamont	3T	3ST
ATN /xexx	Altamont	4T	4ST
ATN /1exx	Altamont	4T	4ST
BKA	Birkenhead	5M	4S
BKA /xcxx	Birkenhead	5M	4S
BKR	Basker	6WI	4D
BNE	Bone	2W	2D
BNE /xcxx	Bone	2WT	2D
CAV	Carvey	5W	4D
CAV1	Carvey	5W	4D
CCS	Cactus	3M	3S
CCS /xcxx	Cactus	3M	3S
CKD	Crookdale	2W	2D
CXF	Carroll	1	1
CXF /xcxx	Carroll	2T	2T
CXT	Capell	2W	2SD
CXT1	Capell	2W	2D
CXT1 /xcxx	Capell	2W	2TD
CXV	Charman	2W	2D
CXV /xcxx	Charman	2WT	2TD
CYN	Croyon	3M	2S
CYN /xcxx	Croyon	3M	2ST
CYN /xdxx	Croyon	3MT	3T
CYN1 /xcxx	Croyon	3M	2T
CYN1 /xdxx	Croyon	3MT	3T
DGF /xc1x	Darlingford	2T	3S
DGF /xdxx	Darlingford	3T	3ST
DGF /xd1x	Darlingford	3T	3ST
DGF /2dxx	Darlingford	3T	3ST
DLN	Danlin	2W	2SD
DOB	Dobbin	3M	3S
DOB /1xxx	Dobbin	4M	3S
DOB /xcxx	Dobbin	4M	3S
DOB /1cxx	Dobbin	4M	3S

TABLE 5. AGRICULTURE CAPABILITY CLASSES FOR SOILS

Map Symbol and Phase	Soil Name	Agricultural Capability Class	Irrigation Suitability
DOB /2cxx	Dobbin	4M	3S
DOB /xdxx	Dobbin	4M	3ST
DOB /1dxx	Dobbin	4M	3ST
DOB /2dxx	Dobbin	4M	3ST
DOB /xexx	Dobbin	4MT	4T
DOB /1exx	Dobbin	5T	4T
DOB /xfxx	Dobbin	5T	4T
DOB /1fxx	Dobbin	5T	4T
DOT /2e1x	Dorset	4T	4TS
DRN /xcxx	Durnan	2T	2T
DXM	Druxman	2M	2SD
DZW	Dezwood	2X	3S
DZW /xcxx	Dezwood	2T	3S
DZW /xc1x	Dezwood	2T	3S
DZW /1cxx	Dezwood	2T	3S
DZW /1c1x	Dezwood	2T	3S
DZW /2c1x	Dezwood	2T	3S
DZW /xdxx	Dezwood	3T	3ST
DZW /xd1x	Dezwood	3T	3TS
DZW /1dxx	Dezwood	3T	3TS
DZW /1d1x	Dezwood	3T	3TS
DZW /2dxx	Dezwood	3T	3ST
DZW /2d1x	Dezwood	3T	3TS
DZW /3d1x	Dezwood	4E	3ST
DZW /xexx	Dezwood	4T	4T
DZW /xe1x	Dezwood	4T	4T
DZW /xe2x	Dezwood	4T	4T
DZW /1exx	Dezwood	4T	4T
DZW /1e1x	Dezwood	4T	4T
DZW /1e2x	Dezwood	4T	4T
DZW /2exx	Dezwood	4T	4T
DZW /2e1x	Dezwood	4T	4T
DZW /3e1x	Dezwood	4T	4T
DZW /xfxx	Dezwood	5T	4T
DZW /xf1x	Dezwood	5T	4T
DZW /xf2x	Dezwood	5T	4T
DZW /1f2x	Dezwood	5T	4T
DZW /2f1x	Dezwood	5T	4T
DZW /2f2x	Dezwood	5T	4T
DZW /xf3x	Dezwood	5T	4T

TABLE 5. AGRICULTURE CAPABILITY CLASSES FOR SOILS

Map Symbol and Phase	Soil Name	Agricultural Capability Class	Irrigation Suitability
DZW /1gxx	Dezwood	6T	4T
ERX	Eroded Slope Compl	6T	4T
FFR	Fifere	2X	3S
FFR /xcxx	Fifere	2T	3S
FFR /1cxx	Fifere	2X	3S
FFR /xdxx	Fifere	3T	3T
FFR /xd1x	Fifere	3T	3TS
FFR /1dxx	Fifere	3T	3TS
FFR /2dxx	Fifere	3T	3TS
FFR /2d1x	Fifere	3T	3TS
FFR /xexx	Fifere	4T	4T
FFR /xe1x	Fifere	4T	4T
FFR /1exx	Fifere	4T	4T
FFR /1e1x	Fifere	4T	4T
FFR /2e1x	Fifere	4T	4T
FFR /xfxx	Fifere	5T	4T
FFR /xf1x	Fifere	5T	4T
FFR /xf2x	Fifere	5T	4T
FFR /xf3x	Fifere	5T	4T
FIR	Firdale	1	1
FIR /xcxx	Firdale	2T	2T
FIR /xdxx	Firdale	3T	3T
FIR /1dxx	Firdale	3T	3T
FIR /xexx	Firdale	4T	4T
FIR /1exx	Firdale	4T	4T
FIR /2exx	Firdale	4T	4T
FIR /xfxx	Firdale	5T	4T
FND	Fairland	1	1
FND /xcxx	Fairland	2T	2T
FND /0cxx	Fairland	2T	2T
FND /2cxx	Fairland	2T	2T
FND /xdxx	Fairland	3T	3T
FND /1dxx	Fairland	3T	3T
FND /3dxx	Fairland	5E	3T
FND /xexx	Fairland	4T	4T
FND /1exx	Fairland	4T	4T
FND /2exx	Fairland	4T	4T
FND /xfxx	Fairland	5T	4T
FND /1fxx	Fairland	5T	4T
FND /3fxx	Fairland	5TE	4T

TABLE 5. AGRICULTURE CAPABILITY CLASSES FOR SOILS

Map Symbol and Phase		Soil Name	Agricultural Capability Class	Irrigation Suitability
FND	/xgxx	Fairland	6T	4T
FRS		Ferris	2W	3D
FRS	/xcxx	Ferris	2W	3DS
GBO		Glenboro	1	1
GBO	/xcxx	Glenboro	2T	2T
GBO	/1cxx	Glenboro	2T	2T
GBO	/xdxx	Glenboro	3T	3T
GBO	/1dxx	Glenboro	3T	3T
GRO		Grover	2W	2D
GRO	/xcxx	Grover	2WT	2TD
GRR		Guerra	5W	4D
GRRp		Guerra	6W	4D
GVS		Gervais	2W	3DS
GVS	/xcxx	Gervais	2W	2DT
GYS		Grayson	5W	4D
HAT		Halstead	2M	1
HAT	/xcxx	Halstead	2MT	2T
HAT	/3cxx	Halstead	5E	2T
HAT	/xdxx	Halstead	3T	3T
HAT	/1dxx	Halstead	3T	3T
HAT	/2dxx	Halstead	3T	3T
HAT	/xexx	Halstead	4T	4T
HAT	/1exx	Halstead	4T	4T
HAT	/2exx	Halstead	4T	4T
HAT	/3exx	Halstead	5E	4T
HAT	/xfxx	Halstead	5T	4T
HAT	/3fxx	Halstead	5ET	4T
HAT	/xgxx	Halstead	6T	4T
HAT	/xhxx	Halstead	7T	4T
HEB		Hebbot	2X	3S
HHF		Hochfeld	3M	2S
HIT	/2d1x	Hilton	3TE	3ST
HIT	/xe1x	Hilton	4T	4T
HIT	/3f1x	Hilton	5TE	4T
HKS		Hickson	5W	4D
HMO		Hummerston	3MW	3SD
HMO	/xcxx	Hummerston	3MW	3SD
HOS		Horose	6W	4D
HRG		Harding	2W	4S
JAY		Jaymar	3M	2S

TABLE 5. AGRICULTURE CAPABILITY CLASSES FOR SOILS

Map Symbol and Phase	Soil Name	Agricultural Capability Class	Irrigation Suitability
JAY /xcxx	Jaymar	2T	2ST
JAY /2exx	Jaymar	4T	4T
JIK	Janick	1	3S
JIK /xcxx	Janick	2T	4S
JIK /xdxx	Janick	3T	4S
JYL	Joyale	2W	3D
JYL /xxxs	Joyale	3NW	3SD
JYL /xxxt	Joyale	4N	3SD
JYL /xcxx	Joyale	2TW	3SD
KIS /xfxx	Kingsley	5T	4T
KUD	Knudson	1	3S
KUD /xcxx	Knudson	2T	3S
KUD /xdxx	Knudson	3T	3ST
KUD /2dxx	Knudson	3T	3ST
KUD /xexx	Knudson	4T	4T
KUD /xe1x	Knudson	4T	4T
LEI	Levine	3I	3D
LEI /xcxx	Levine	3I	3D
LEI /xdxx	Levine	3T	3DT
LRY	Leary	5M	4S
LRY /xcxx	Leary	5M	4S
LRY /xc1x	Leary	5M	4S
LRY /xdxx	Leary	5M	4S
LRY /xd1x	Leary	5M	4S
LRY /1dxx	Leary	5M	4S
LRY /1d1x	Leary	5M	4S
LRY1 /xdxx	Leary	5M	4S
LRY1 /xd1x	Leary	5M	4S
LRY1 /1dxx	Leary	5M	4S
LRY1 /1d1x	Leary	5M	4S
LRY /xexx	Leary	5M	4ST
LRY /xe1x	Leary	5M	4ST
LRY /1e1x	Leary	5M	4ST
LRY /1e2x	Leary	5M	4ST
LRY /2exx	Leary	5M	4ST
LRY /2e1x	Leary	5M	4ST
LRY /3e1x	Leary	5M	4ST
LRY1 /xe1x	Leary	5M	4ST
LRY1 /1exx	Leary	5M	4ST
LRY1 /2exx	Leary	5M	4ST

TABLE 5. AGRICULTURE CAPABILITY CLASSES FOR SOILS

Map Symbol and Phase	Soil Name	Agricultural Capability Class	Irrigation Suitability
LRY1 /3e1x	Leary	5M	4ST
LRY /xfxx	Leary	5MT	4ST
LRY /xf1x	Leary	5MT	4ST
LRY /1fxx	Leary	5MT	4ST
LRY /2f1x	Leary	5MT	4ST
LRY /3f2x	Leary	5MT	4ST
LSL	La Salle	2X	1
LSL /0cxx	La Salle	2T	2T
LSL /xcxx	La Salle	2T	2T
LSL /xc2x	La Salle	2T	2T
LSL1 /xcxx	La Salle	2T	3S
LSL /xdxx	La Salle	3T	3T
LSR	Landseer	5W	4DS
LSR /xxxs	Landseer	5W	4DS
LSR /xxxu	Landseer	5WN	4DS
LVH	Lavenham	3MW	3SD
LVH /xcxx	Lavenham	3MW	3SD
LVH /1cxx	Lavenham	3MW	3SD
LWN	Lowton	5W	4S
MDN /xxxu	Marsden	5W	4DS
MHC	Marsh Complex	7W	4D
MKY	Mockry	5W	4D
MKYp	Mockry	5W	4D
MOW	Mowbray	1	1
MOW /xcxx	Mowbray	2T	2T
MOW /xdxx	Mowbray	3T	3T
MRH	Marringhurst	5M	4S
MRH /xc1x	Marringhurst	5M	4S
MRH1 /3cxx	Marringhurst	5M	4S
MXT	Melland	2W	3SD
MXT /xxxu	Melland	2W	4D
NKK /xcxx	Nikkel	2W	2T
NKK /xdxx	Nikkel	3T	3D
NSH	Narish	4W	4D
NYO /xcxx	Nayler	2T	4S
NYO /xdxx	Nayler	3T	4S
NYO /xexx	Nayler	4T	4ST
NYO /1exx	Nayler	4T	4ST
NYO /xfxx	Nayler	5T	4ST
NYO /1fxx	Nayler	5T	4ST

TABLE 5. AGRICULTURE CAPABILITY CLASSES FOR SOILS

Map Symbol and Phase	Soil Name	Agricultural Capability Class	Irrigation Suitability
NYO /xf3x	Nayler	5T	4ST
OBR	Oberon	2W	2D
OIV	Oliver	3W	3S
OIV /xxxs	Oliver	3N	3S
OIV /xxxt	Oliver	5N	4S
OIV /xxxu	Oliver	6N	4S
OLK	Ollneck	2W	3SD
OLK /xcxx	Ollneck	2WT	3SD
ONH	Onahan	4MW	3S
ONH /xcxx	Onahan	4MW	4S
ONH /xdxx	Onahan	4M	3SD
ONH /xexx	Onahan	4MT	4ST
PBI /xdxx	Pembina	3T	3ST
PBI /xexx	Pembina	4T	4T
PBI /2exx	Pembina	4TE	4T
PBI /2elx	Pembina	4TE	4T
PBI /3elx	Pembina	5E	4T
PBI /xfxx	Pembina	5T	4T
PBI /xglx	Pembina	6T	4T
PDA	Prodan	2W	2D
PDA /xxxs	Prodan	3N	3S
PDA /xxxt	Prodan	5N	4S
PDA /xxxu	Prodan	6N	4S
PDA /xcxx	Prodan	2WT	2T
PER	Perillo	O3W	4D
PERd	Perillo	O3W	4DS
PPR	Poplar Point	3I	2SD
PPR /xcxx	Poplar Point	3I	2SD
PTR	Petrel	2W	2D
RAM	Ramada	1	1
RAM /0cxx	Ramada	2T	2T
RAM /xcxx	Ramada	2T	2T
RAM /xdxx	Ramada	3T	3T
RAM /1dxx	Ramada	3T	3T
RAM /2dxx	Ramada	3T	3T
RAM /xexx	Ramada	4T	4T
RAM /1exx	Ramada	4T	4T
RAM /2exx	Ramada	4T	4T
RMP	Rempel	1	1
SCK	Stockton	3M	3S

TABLE 5. AGRICULTURE CAPABILITY CLASSES FOR SOILS

Map Symbol and Phase	Soil Name	Agricultural Capability Class	Irrigation Suitability
SCK /0xxx	Stockton	3M	3S
SCK /1xxx	Stockton	3M	3S
SCK /xcxx	Stockton	3M	3S
SCK /0cxx	Stockton	3M	3S
SCK /1cxx	Stockton	3M	3S
SCK /2cxx	Stockton	4EM	3S
SCK /3cxx	Stockton	5E	3S
SCK /xdxx	Stockton	3MT	3T
SCK /1dxx	Stockton	3MT	3ST
SCK /2dxx	Stockton	3MT	3ST
SCK /xexx	Stockton	4T	4T
SCK /1exx	Stockton	4T	4T
SCK /xfxx	Stockton	5T	4T
SCK /xgxx	Stockton	6T	4T
SEE	Sewell	5W	4D
SEEp	Sewell	6W	4D
SEU /xfxx	Shellmouth Complex	6E	4T
SGO /xcxx	Sigmund	2T	4S
SGO /xxxt	Sigmund	5N	4SD
SHX	Shilox	5M	4S
SHX /xcxx	Shilox	5M	4S
SHX /xdxx	Shilox	5M	3ST
SHX /1dxx	Shilox	5M	3ST
SHX /xexx	Shilox	5M	4ST
SHX /xfxx	Shilox	5MT	4ST
SHX /1fxx	Shilox	5ST	4ST
SHX /xgxx	Shilox	6T	4ST
SHX /xhxx	Shilox	7T	4ST
SXP	Sutton	5W	4D
SXPp	Sutton	5W	4D
TDP	Tadpole	4W	4D
TDP /xxxs	Tadpole	4W	4D
TDP /xxxt	Tadpole	5NW	4D
TDP /xxxu	Tadpole	6WN	4D
TDP /xx3t	Tadpole	5NW	4D
TDP /xcxx	Tadpole	5W	4D
TDPd	Tadpole	3W	4D
TDPp	Tadpole	4W	4D
TDPp /xxxs	Tadpole	5WN	4D
TGL /2clx	Tiger Hills	2TE	3S

TABLE 5. AGRICULTURE CAPABILITY CLASSES FOR SOILS

Map Symbol and Phase	Soil Name	Agricultural Capability Class	Irrigation Suitability
TGL /2exx	Tiger Hills	4TE	4T
TGL /2f2x	Tiger Hills	5T	4T
TGR	Taggart	2W	2D
TGR /xcxx	Taggart	2TW	2DT
TLI	Tellier	2W	3D
TLI /xcxx	Tellier	2T	3D
TOC	Torcan	2W	2D
ULH	Ullrich	2W	3D
ULH /xxxs	Ullrich	3N	3D
ULH /xxxt	Ullrich	5N	4D
ULH /xcxx	Ullrich	2T	3D
VDL /xcxx	Vandal	3M	2S
VDL /xdxx	Vandal	3MT	4ST
VDL1	Vandal	2X	3S
VDL1 /xcxx	Vandal	2MT	2TS
VDL1 /xdxx	Vandal	3T	3T
VDL1 /xd1x	Vandal	3T	3T
VDS	Vordas	5W	4D
VDSp	Vordas	6W	4D
VTL	Vartel	4M	2SD
VTL1	Vartel	2W	2SD
WIK /xcxx	Winkler	2T	3S
WWB	Willowbend	6WI	4SD
WWBp	Willowbend	6W	4D
WWD	Wellwood	1	1
WWD /2xxx	Wellwood	1	1
WWD /xcxx	Wellwood	2T	2T
WWD /1dxx	Wellwood	3T	3T
XVI	Xavier	O3W	4D

TABLE 6. SUITABILITY RATINGS OF SOILS FOR RECREATIONAL USES

Map Symbol and Phase	Soil Name	Play Ground	Picnic Area	Camp Area	Path And Trails	Permanent Bldgs. Without Basements
AIZ	Arizona	Ps	Fs	Fs	Ps	G
ASB	Assiniboine	Psk	Ps	Psi	Ps	Pai
ATN	Altamont	Fs	Fs	Fs	Fs	Fa
ATN /xcxx	Altamont	Fst	Fs	Fs	Fs	Fa
ATN /xdxx	Altamont	Pt	Fs	Fs	Fs	Fa
ATN /xd1x	Altamont	Pt	Fs	Fs	Fs	Fa
ATN /1d1x	Altamont	Pt	Fs	Fs	Fs	Fa
ATN /xexx	Altamont	Vt	Fst	Fst	Fs	Fat
ATN /1exx	Altamont	Vt	Fst	Fst	Fs	Fat
BKA	Birkenhead	Vs	Pm	Fs	G	G
BKA /xcxx	Birkenhead	Vs	Pm	Fs	G	G
BKR	Basker	Viw	Vwi	Vwi	Pw	Vh
BNE	Bone	Fw	Fw	Fw	Fw	Faw
BNE /xcxx	Bone	Fwt	Fw	Fw	Fw	Faw
CAV	Carvey	Pw	Pw	Pw	Pw	Pw
CAV1	Carvey	Pw	Pw	Pw	Pw	Pw
CCS	Cactus	Fs	Fsm	Fs	G	G
CCS /xcxx	Cactus	Fst	Fsm	Fs	G	G
CKD	Crookdale	Fsw	Fsw	Fsw	Fsw	Fws
CXF	Carroll	Fks	Fs	Fks	Fs	Fa
CXF /xcxx	Carroll	Fst	Fs	Fks	Fs	Fa
CXT	Capell	Fsw	Fsw	Fsw	Fsw	Fw
CXT1	Capell	Fsw	Fsw	Fsw	Fsw	Fw
CXT1 /xcxx	Capell	Fwt	Fsw	Fsw	Fsw	Fw
CXV	Charman	Fsw	Fsw	Fsw	Fsw	Faw
CXV /xcxx	Charman	Fwt	Fsw	Fsw	Fsw	Faw
CYN	Croyon	Fs	Fsm	Fs	Fs	G
CYN /xcxx	Croyon	Fst	Fsm	Fs	Fs	G
CYN /xdxx	Croyon	Pt	Fsm	Fs	Fs	G
CYN1 /xcxx	Croyon	Fst	Fsm	Fs	Fs	G
CYN1 /xdxx	Croyon	Pt	Fsm	Fs	Fs	G
DGF /xc1x	Darlingford	Fst	Fs	Fs	Fs	Fa
DGF /xdxx	Darlingford	Pt	Fs	Fs	Fs	Fa
DGF /xd1x	Darlingford	Pt	Fs	Fs	Fs	Fa
DGF /2dxx	Darlingford	Pt	Fs	Fs	Fs	Fa
DLN	Danlin	Fsw	Fsw	Fsw	Fsw	Faw
DOB	Dobbin	Fm	Fm	Fs	G	G
DOB /1xxx	Dobbin	Fm	Fm	Fs	G	G
DOB /xcxx	Dobbin	Fmt	Fm	Fs	G	G
DOB /1cxx	Dobbin	Fmt	Fm	Fs	G	G

TABLE 6. SUITABILITY RATINGS OF SOILS FOR RECREATIONAL USES

Map Symbol and Phase	Soil Name	Play Ground	Picnic Area	Camp Area	Path And Trails	Permanent Bldgs. Without Basements
DOB /2cxx	Dobbin	Fmt	Fsm	Fs	G	G
DOB /xdxx	Dobbin	Pt	Fm	Fs	G	G
DOB /1dxx	Dobbin	Pt	Fm	Fs	G	G
DOB /2dxx	Dobbin	Pt	Fm	Fs	G	G
DOB /xexx	Dobbin	Vt	Fmt	Fst	G	Ft
DOB /1exx	Dobbin	Vt	Ftm	Fts	G	Ft
DOB /xfxx	Dobbin	Vt	Pt	Pt	Ft	Pt
DOB /1fxx	Dobbin	Vt	Pt	Pt	Ft	Pt
DOT /2e1x	Dorset	Vts	Ft	Ft	G	Ft
DRN /xcxx	Durnan	Fst	Fs	Fs	Fs	Fa
DXM	Druxman	Fsw	Fsw	Fs	Fsw	Fwa
DZW	Dezwood	Fs	Fs	Fs	Fs	Fa
DZW /xcxx	Dezwood	Fts	Fs	Fs	Fs	Fa
DZW /xc1x	Dezwood	Fts	Fs	Fs	Fs	Fa
DZW /1cxx	Dezwood	Fst	Fs	Fs	Fs	Fa
DZW /1c1x	Dezwood	Fts	Fs	Fs	Fs	Fa
DZW /2c1x	Dezwood	Fts	Fs	Fs	Fs	Fa
DZW /xdxx	Dezwood	Pt	Fs	Fs	Fs	Fa
DZW /xd1x	Dezwood	Pt	Fs	Fs	Fs	Fa
DZW /1dxx	Dezwood	Pt	Fs	Fs	Fs	Fa
DZW /1d1x	Dezwood	Pt	Fs	Fs	Fs	Fa
DZW /2dxx	Dezwood	Pt	Fs	Fs	Fs	Fa
DZW /2d1x	Dezwood	Pt	Fs	Fs	Fs	Fa
DZW /3d1x	Dezwood	Pt	Fs	Fs	Fs	Fa
DZW /xexx	Dezwood	Vt	Fst	Fts	Fs	Fta
DZW /xe1x	Dezwood	Vt	Fst	Fts	Fs	Fta
DZW /xe2x	Dezwood	Vt	Fst	Fst	Fs	Fat
DZW /1exx	Dezwood	Vt	Fst	Fst	Fs	Fat
DZW /1e1x	Dezwood	Vt	Fst	Fst	Fs	Fat
DZW /1e2x	Dezwood	Vt	Fst	Fst	Fs	Fat
DZW /2exx	Dezwood	Vt	Fst	Fst	Fs	Fat
DZW /2e1x	Dezwood	Vt	Fst	Fst	Fs	Fta
DZW /3e1x	Dezwood	Vt	Fst	Fst	Fs	Fat
DZW /xfxx	Dezwood	Vt	Pt	Pt	Fst	Pt
DZW /xf1x	Dezwood	Vt	Pt	Pt	Fst	Pt
DZW /xf2x	Dezwood	Vt	Pt	Pt	Fst	Pt
DZW /1f2x	Dezwood	Vt	Pt	Pt	Fst	Pt
DZW /2f1x	Dezwood	Vt	Pt	Pt	Fst	Pt
DZW /2f2x	Dezwood	Vt	Pt	Pt	Fst	Pt
DZW /xf3x	Dezwood	Vt	Pt	Pt	Fst	Pt

TABLE 6. SUITABILITY RATINGS OF SOILS FOR RECREATIONAL USES

Map Symbol and Phase	Soil Name	Play Ground	Picnic Area	Camp Area	Path And Trails	Permanent Bldgs. Without Basements
DZW /1gxx	Dezwood	Vt	Vt	Vt	Pt	Vt
ERX	Eroded Slope Compl	Vt	Vt	Vt	Pt	Vt
FFR	Fifere	Fs	Fs	Fs	Fs	Fa
FFR /xcxx	Fifere	Fst	Fs	Fs	Fs	Fa
FFR /1cxx	Fifere	Fst	Fs	Fa	Fs	Fa
FFR /xdxx	Fifere	Pt	Fs	Fs	Fs	Fa
FFR /xd1x	Fifere	Pt	Fs	Fs	Fs	Fa
FFR /1dxx	Fifere	Pt	Fs	Fs	Fs	Fa
FFR /2dxx	Fifere	Pt	Fs	Fs	Fs	Fa
FFR /2d1x	Fifere	Pt	Fs	Fs	Fs	Fa
FFR /xexx	Fifere	Vt	Fst	Fst	Fs	Fat
FFR /xe1x	Fifere	Vt	Fst	Fst	Fs	Fat
FFR /1exx	Fifere	Vt	Fst	Fst	Fs	Fat
FFR /1e1x	Fifere	Vt	Fst	Fst	Fs	Fat
FFR /2e1x	Fifere	Vt	Fst	Fst	Fs	Fat
FFR /xfxx	Fifere	Vt	Pt	Pt	Fts	Pt
FFR /xf1x	Fifere	Vt	Pt	Pt	Fts	Pt
FFR /xf2x	Fifere	Vt	Pt	Pt	Fts	Pt
FFR /xf3x	Fifere	Vt	Pt	Ptp	Fts	Pt
FIR	Firdale	Fs	Fs	Fs	Fs	Fa
FIR /xcxx	Firdale	Fst	Fs	Fs	Fs	Fa
FIR /xdxx	Firdale	Pt	Fs	Fs	Fs	Fa
FIR /1dxx	Firdale	Pt	Fs	Fs	Fs	Fa
FIR /xexx	Firdale	Vt	Fst	Fst	Fs	Fat
FIR /1exx	Firdale	Vt	Fst	Fst	Fs	Fat
FIR /2exx	Firdale	Vt	Fst	Fst	Fs	Fat
FIR /xfxx	Firdale	Vt	Pt	Pt	Fst	Pt
FND	Fairland	G	G	G	G	Fa
FND /xcxx	Fairland	Ft	G	G	G	Fa
FND /0cxx	Fairland	Ft	G	G	G	Fa
FND /2cxx	Fairland	Ft	G	G	G	Fa
FND /xdxx	Fairland	Pt	G	G	G	Fa
FND /1dxx	Fairland	Pt	G	G	G	Fa
FND /3dxx	Fairland	Pt	G	G	G	Fa
FND /xexx	Fairland	Vt	Ft	Ft	G	Fat
FND /1exx	Fairland	Vt	Ft	Ft	G	Fat
FND /2exx	Fairland	Vt	Ft	Ft	G	Fat
FND /xfxx	Fairland	Vt	Pt	Pt	Ft	Pt
FND /1fxx	Fairland	Vt	Pt	Pt	Ft	Pt
FND /3fxx	Fairland	Vt	Pt	Pt	Ft	Pt

TABLE 6. SUITABILITY RATINGS OF SOILS FOR RECREATIONAL USES

Map Symbol and Phase	Soil Name	Play Ground	Picnic Area	Camp Area	Path And Trails	Permanent Bldgs. Without Basements
FND /xgxx	Fairland	Vt	Vt	Vt	Pt	Vt
FRS	Ferris	Fws	Fws	Fws	Fws	Faw
FRS /xcxx	Ferris	Fsw	Fsw	Fsw	Fsw	Faw
GBO	Glenboro	G	G	G	G	G
GBO /xcxx	Glenboro	Ft	G	G	G	G
GBO /1cxx	Glenboro	Ft	G	G	G	G
GBO /xdxx	Glenboro	Pt	G	G	G	G
GBO /1dxx	Glenboro	Pt	G	G	G	G
GRO	Grover	Fw	Fw	Fw	Fw	Fw
GRO /xcxx	Grover	Fwt	Fw	Fw	Fw	Fw
GRR	Guerra	Pw	Pw	Pw	Pw	Pw
GRRp	Guerra	Vws	Vws	Vws	Vs	Vaw
GVS	Gervais	Fsw	Fsw	Fsw	Fsw	Pi
GVS /xcxx	Gervais	Fst	Fsw	Fsw	Fsw	Pi
GYS	Grayson	Pw	Pw	Pw	Pw	Pw
HAT	Halstead	G	G	G	G	G
HAT /xcxx	Halstead	Ft	G	G	G	G
HAT /3cxx	Halstead	Ft	G	G	G	G
HAT /xdxx	Halstead	Pt	G	G	G	G
HAT /1dxx	Halstead	Pt	G	G	G	G
HAT /2dxx	Halstead	Pt	G	G	G	G
HAT /xexx	Halstead	Vt	Ft	Ft	G	Fta
HAT /1exx	Halstead	Vt	Ft	Ft	G	Fta
HAT /2exx	Halstead	Vt	Ft	Ft	G	Fta
HAT /3exx	Halstead	Vt	Ft	Ft	G	Fat
HAT /xfxx	Halstead	Vt	Pt	Pt	Ft	Pt
HAT /3fxx	Halstead	Vt	Pt	Pt	Ft	Pt
HAT /xgxx	Halstead	Vt	Vt	Vt	Pt	Vt
HAT /xhxx	Halstead	Vt	Vt	Vt	Vt	Vt
HEB	Hebbot	Fs	Fs	Fs	Fs	Fa
HHF	Hochfeld	G	G	G	G	Fa
HIT /2d1x	Hilton	Pt	Fs	Fs	Fs	Fa
HIT /xe1x	Hilton	Vt	Fst	Fst	Fs	Fat
HIT /3f1x	Hilton	Vt	Pt	Pt	Fst	Pt
HKS	Hickson	Pw	Pw	Pw	Pw	Pw
HMO	Hummerston	Fsw	Fsw	Fsw	Fw	Fw
HMO /xcxx	Hummerston	Fsw	Fsw	Fsw	Fw	Fw
HOS	Horose	Pw	Pw	Pw	Pw	Pw
HRG	Harding	Ps	Pws	Pws	Ps	Pa
JAY	Jaymar	Fsq	Fs	Fs	Fs	Fa

TABLE 6. SUITABILITY RATINGS OF SOILS FOR RECREATIONAL USES

Map Symbol and Phase	Soil Name	Play Ground	Picnic Area	Camp Area	Path And Trails	Permanent Bldgs. Without Basements
JAY /xcxx	Jaymar	Fst	Fs	Fs	Fs	Fa
JAY /2exx	Jaymar	Vt	Fst	Fst	Fs	Fat
JIK	Janick	Ps	Ps	Ps	Ps	Pa
JIK /xcxx	Janick	Ps	Ps	Ps	Ps	Pa
JIK /xdxx	Janick	Ps	Ps	Ps	Ps	Pa
JYL	Joyale	Fsw	Fsw	Fsw	Fsw	Faw
JYL /xxxs	Joyale	Fsw	Fsw	Fsw	Fsw	Faw
JYL /xxxt	Joyale	Pn	Pn	Pn	Fsw	Fa
JYL /xcxx	Joyale	Fsw	Fsw	Fsw	Fsw	Faw
KIS /xfxx	Kingsley	Vt	Pt	Pt	Fst	Pt
KUD	Knudson	Fs	Fs	Fs	Fs	Fa
KUD /xcxx	Knudson	Fst	Fs	Fs	Fs	Fa
KUD /xdxx	Knudson	Pt	Fs	Fs	Fs	Fa
KUD /2dxx	Knudson	Pt	Fs	Fs	Fs	Fa
KUD /xexx	Knudson	Vt	Fts	Fts	Fs	Fat
KUD /xelx	Knudson	Vt	Fts	Fts	Fs	Fat
LEI	Levine	Fis	Fis	Pi	Fsw	Pi
LEI /xcxx	Levine	Fsi	Fsi	Pi	Fsw	Pi
LEI /xdxx	Levine	Pt	Fsi	Fis	Fsw	Pi
LRY	Leary	Vs	Pm	G	G	G
LRY /xcxx	Leary	Vs	Pm	G	G	G
LRY /xclx	Leary	Vs	Pm	G	G	G
LRY /xdxx	Leary	Vs	Pm	G	G	G
LRY /xdlx	Leary	Vs	Pm	G	G	G
LRY /ldxx	Leary	Vs	Pm	G	G	G
LRY /ldlx	Leary	Vs	Pm	G	G	G
LRYl /xdxx	Leary	Vs	Pm	G	G	G
LRYl /xdlx	Leary	Vs	Pm	G	G	G
LRYl /ldxx	Leary	Vs	Pm	G	G	G
LRYl /ldlx	Leary	Vs	Pm	G	G	G
LRY /xexx	Leary	Vts	Pm	Ft	G	Ft
LRY /xelx	Leary	Vts	Pm	Ft	G	Ft
LRY /lelx	Leary	Vts	Pm	Ft	G	Ft
LRY /le2x	Leary	Vts	Pm	Ftp	G	Ft
LRY /2exx	Leary	Vts	Pm	Ft	G	Ft
LRY /2elx	Leary	Vts	Pm	Ft	G	Ft
LRY /3elx	Leary	Vts	Pm	Ft	G	Ft
LRYl /xelx	Leary	Vts	Pm	Ft	G	Ft
LRYl /lexx	Leary	Vts	Pm	Ft	G	Ft
LRYl /2exx	Leary	Vts	Pm	Ft	G	Ft

TABLE 6. SUITABILITY RATINGS OF SOILS FOR RECREATIONAL USES

Map Symbol and Phase		Soil Name	Play Ground	Picnic Area	Camp Area	Path And Trails	Permanent Bldgs. Without Basements
LRY1	/3e1x	Leary	Vts	Pm	Ft	G	Ft
LRY	/xfxx	Leary	Vst	Ptm	Pt	Ft	Pt
LRY	/xf1x	Leary	Vts	Pmt	Pt	Ft	Pt
LRY	/1fxx	Leary	Vts	Ptm	Pt	Ft	Pt
LRY	/2f1x	Leary	Vts	Pmt	Pt	Ft	Pt
LRY	/3f2x	Leary	Vts	Pmt	Pt	Ft	Pt
LSL		La Salle	Fs	Fs	Fs	Fs	Pi
LSL	/0cxx	La Salle	Fst	Fs	Fs	Fs	Pi
LSL	/xcxx	La Salle	Fst	Fs	Fs	Fs	Pi
LSL	/xc2x	La Salle	Ftp	Fs	Fsp	Fs	Pi
LSL1	/xcxx	La Salle	Ps	Fs	Fs	Fs	Pi
LSL	/xdxx	La Salle	Vt	Fs	Fs	Fs	Pi
LSR		Landseer	Psw	Psw	Psw	Psw	Paw
LSR	/xxxs	Landseer	Psw	Psw	Psw	Psw	Paw
LSR	/xxxu	Landseer	Vn	Vn	Vn	Psw	Paw
LVH		Lavenham	Fws	Fws	Fws	Fw	Fw
LVH	/xcxx	Lavenham	Fsw	Fsw	Fsw	Fw	Fw
LVH	/1cxx	Lavenham	Fsw	Fsw	Fsw	Fw	Fw
LWN		Lowton	Psw	Psw	Psw	Pw	Paw
MDN	/xxxu	Marsden	Vn	Vn	Vn	Pw	Pw
MHC		Marsh Complex	Vw	Vw	Vw	Vw	Vw
MKY		Mockry	Pw	Pw	Pw	Pw	Pw
MKYp		Mockry	Vs	Vs	Vs	Vs	Pw
MOW		Mowbray	Fs	Fs	Fs	Fs	Fs
MOW	/xcxx	Mowbray	Fst	Fs	Fs	Fs	Fs
MOW	/xdxx	Mowbray	Pt	Fs	Fs	Fs	Fa
MRH		Marringhurst	Pmq	Fs	Fs	G	G
MRH	/xc1x	Marringhurst	Pmg	Pm	G	G	G
MRH1	/3cxx	Marringhurst	Vs	Vs	Vs	Vs	G
MXT		Melland	Fws	Fws	Fws	Fws	Fw
MXT	/xxxu	Melland	Fws	Fws	Fws	Fws	Fw
NKK	/xcxx	Nikkel	Fwt	Fws	Fws	Fsw	Faw
NKK	/xdxx	Nikkel	Pt	Fws	Fws	Fsw	Faw
NSH		Narish	Pw	Pw	Pw	Pw	Pw
NYO	/xcxx	Nayler	Fst	Fs	Fs	Fs	Fa
NYO	/xdxx	Nayler	Pt	Fs	Fs	Fs	Fa
NYO	/xexx	Nayler	Vt	Fst	Fst	Fs	Fat
NYO	/1exx	Nayler	Vt	Fst	Fst	Fs	Fat
NYO	/xfxx	Nayler	Vt	Pt	Pt	Fst	Pt
NYO	/1fxx	Nayler	Vt	Pt	Pt	Fst	Pt

TABLE 6. SUITABILITY RATINGS OF SOILS FOR RECREATIONAL USES

Map Symbol and Phase		Soil Name	Play Ground	Picnic Area	Camp Area	Path And Trails	Permanent Bldgs. Without Basements
NYO	/xf3x	Nayler	Vt	Pt	Ptp	Fpt	Pt
OBR		Oberon	Fsw	Fs	Fsw	Fsw	Fw
OIV		Oliver	Ps	Ps	Ps	Ps	Fw
OIV	/xxxs	Oliver	Ps	Pws	Psn	Ps	Fw
OIV	/xxxt	Oliver	Pws	Pws	Pws	Ps	Fw
OIV	/xxxu	Oliver	Pws	Pws	Pws	Ps	Fw
OLK		Ollneck	Fsw	Fsw	Fsw	Fsw	Faw
OLK	/xcxx	Ollneck	Fsw	Fsw	Fsw	Fsw	Faw
ONH		Onahan	Fw	Fws	Fws	Fw	Fw
ONH	/xcxx	Onahan	Fwt	Fws	Fws	Fw	Fw
ONH	/xdxx	Onahan	Pt	Fw	Fw	Fw	Fw
ONH	/xexx	Onahan	Vt	Fwt	Fwt	Fwt	Fwt
PBI	/xdxx	Pembina	Pt	Fs	Fs	Fs	Fa
PBI	/xexx	Pembina	Vt	Fst	Fst	Fs	Fat
PBI	/2exx	Pembina	Vt	Fst	Fst	Fs	Fat
PBI	/2e1x	Pembina	Vt	Fst	Fst	Fs	Fat
PBI	/3e1x	Pembina	Vt	Fst	Fst	Fs	Fat
PBI	/xfxx	Pembina	Vt	Pt	Pt	Fst	Pt
PBI	/xg1x	Pembina	Vt	Vt	Vt	Pt	Vt
PDA		Prodan	Fsw	Fsw	Fsw	Fsw	Faw
PDA	/xxxs	Prodan	Fws	Fws	Fws	Fsw	Faw
PDA	/xxxt	Prodan	Fsw	Fsw	Fsw	Fsw	Faw
PDA	/xxxu	Prodan	Fsw	Fsw	Fsw	Fsw	Faw
PDA	/xcxx	Prodan	Fst	Fsw	Fsw	Fsw	Faw
PER		Perillo	Vsw	Vsw	Vsw	Vsw	Va
PERd		Perillo	Vsw	Vsw	Vsw	Vsw	Va
PPR		Poplar Point	Fsw	Fsw	Fsw	Fsw	Piw
PPR	/xcxx	Poplar Point	Fst	Fsw	Fsw	Fsw	Piw
PTR		Petrel	Fw	Fw	Fw	Fw	Fw
RAM		Ramada	Fs	Fs	Fs	Fs	Fa
RAM	/0cxx	Ramada	Fst	Fs	Fs	Fs	Fa
RAM	/xcxx	Ramada	Fst	Fs	Fs	Fs	Fa
RAM	/xdxx	Ramada	Pt	Fs	Fs	Fs	Fa
RAM	/1dxx	Ramada	Pt	Fs	Fs	Fs	Fa
RAM	/2dxx	Ramada	Pt	Fs	Fs	Fs	Fa
RAM	/xexx	Ramada	Vt	Fst	Fst	Fs	Fat
RAM	/1exx	Ramada	Vt	Fst	Fst	Fs	Fat
RAM	/2exx	Ramada	Vt	Fst	Fst	Fs	Fat
RMP		Rempel	Fs	Fs	Fs	Fs	Fa
SCK		Stockton	Fs	Fs	Fs	G	G

TABLE 6. SUITABILITY RATINGS OF SOILS FOR RECREATIONAL USES

Map Symbol and Phase	Soil Name	Play Ground	Picnic Area	Camp Area	Path And Trails	Permanent Bldgs. Without Basements
SCK /0xxx	Stockton	Fs	Fs	Fs	G	G
SCK /1xxx	Stockton	Fs	Fs	Fs	G	G
SCK /xcxx	Stockton	Fst	Fs	Fs	G	G
SCK /0cxx	Stockton	Fst	Fs	Fs	G	G
SCK /1cxx	Stockton	Fts	Fs	Fs	G	G
SCK /2cxx	Stockton	Vs	Vs	Vs	Vs	G
SCK /3cxx	Stockton	Vs	Vs	Vs	Vs	G
SCK /xdxx	Stockton	Pt	Fs	Fs	G	G
SCK /1dxx	Stockton	Pt	Fs	Fs	G	G
SCK /2dxx	Stockton	Vs	Vs	Vs	Vs	G
SCK /xexx	Stockton	Vt	Fst	Fst	G	Ft
SCK /1exx	Stockton	Vt	Fst	Fst	G	Ft
SCK /xfxx	Stockton	Vt	Pt	Pt	Ft	Pt
SCK /xgxx	Stockton	Vt	Vt	Vt	Pt	Pt
SEE	Sewell	Pw	Pw	Pw	Pw	Pw
SEEp	Sewell	Vsw	Vsw	Vsw	Vs	Vah
SEU /xfxx	Shellmouth Complex	Vt	Pt	Pt	Fst	Pt
SGO /xcxx	Sigmund	Psw	Psw	Psw	Ps	Fw
SGO /xxxt	Sigmund	Psw	Psw	Psw	Ps	Fw
SHX	Shilox	Vs	Vs	Vs	Vs	G
SHX /xcxx	Shilox	Vs	Vs	Vs	Vs	G
SHX /xdxx	Shilox	Vs	Vs	Vs	Vs	G
SHX /1dxx	Shilox	Vs	Vs	Vs	Vs	G
SHX /xexx	Shilox	Vts	Vs	Vs	Vs	Ft
SHX /xfxx	Shilox	Vts	Vs	Vs	Vs	Pt
SHX /1fxx	Shilox	Vst	Vs	Vs	Vs	Pt
SHX /xgxx	Shilox	Vts	Vts	Vts	Vs	Vt
SHX /xhxx	Shilox	Vts	Vts	Vts	Vs	Vt
SXP	Sutton	Pw	Pw	Pw	Pw	Pw
SXPp	Sutton	Vw	Vws	Vws	Vs	Pw
TDP	Tadpole	Vw	Vw	Vw	Pw	Pw
TDP /xxxs	Tadpole	Pwn	Pwn	Pwn	Pw	Pw
TDP /xxxt	Tadpole	Pw	Pw	Pw	Pw	Pw
TDP /xxxu	Tadpole	Vn	Vn	Vn	Pw	Pw
TDP /xx3t	Tadpole	Pwp	Pw	Pwp	Pw	Pw
TDP /xcxx	Tadpole	Pw	Pw	Pw	Pw	Pw
TDPd	Tadpole	Pw	Pw	Pw	Pw	Pw
TDPp	Tadpole	Vw	Vw	Vw	Pw	Pw
TDPp /xxxs	Tadpole	Vw	Vw	Vw	Pw	Pw
TGL /2c1x	Tiger Hills	Ft	Fs	Fs	Fs	Fa

TABLE 6. SUITABILITY RATINGS OF SOILS FOR RECREATIONAL USES

Map Symbol and Phase		Soil Name	Play Ground	Picnic Area	Camp Area	Path And Trails	Permanent Bldgs. Without Basements
TGL	/2exx	Tiger Hills	Vt	Fst	Fst	Fs	Fat
TGL	/2f2x	Tiger Hills	Vt	Pt	Pt	Fst	Pt
TGR		Taggart	Fsw	Fsw	Fsw	Fsw	Faw
TGR	/xcxx	Taggart	Fwt	Fsw	Fsw	Fsw	Faw
TLI		Tellier	Fsw	Fsw	Fsw	Fsw	Faw
TLI	/xcxx	Tellier	Fsw	Fsw	Fsw	Fsw	Faw
TOC		Torcan	Fsw	Fsw	Fsw	Fsw	Faw
ULH		Ullrich	Fsw	Fsw	Fsw	Fsw	Faw
ULH	/xxxs	Ullrich	Fsw	Fsw	Fsw	Fsw	Faw
ULH	/xxxt	Ullrich	Fsw	Fsw	Fsw	Fsw	Faw
ULH	/xcxx	Ullrich	Fsw	Fsw	Fsw	Fsw	Faw
VDL	/xcxx	Vandal	Pqt	Fsm	Fs	Fs	G
VDL	/xdxx	Vandal	Pqt	Fsm	Fs	Fs	G
VDL1		Vandal	Pqt	Fsm	Fs	Fs	G
VDL1	/xcxx	Vandal	Pqt	Fsm	Fs	Fs	G
VDL1	/xdxx	Vandal	Pqt	Fsm	Fs	Fs	G
VDL1	/xd1x	Vandal	Pqt	Fsm	Fs	Fs	G
VDS		Vordas	Pw	Pw	Pw	Pw	Pw
VDSp		Vordas	Vw	Vw	Vw	Pw	Vhi
VTL		Vartel	Fsw	Fws	Fws	Fsw	Fw
VTL1		Vartel	Fsw	Fsw	Fsw	Fsw	Fw
WIK	/xcxx	Winkler	Ps	Ps	Ps	Ps	Pa
WWB		Willowbend	Viw	Viw	Viw	Viw	Vi
WWBp		Willowbend	Vws	Vws	Vws	Vws	Viw
WWD		Wellwood	Fs	Fs	Fs	Fs	Fa
WWD	/2xxx	Wellwood	Fs	Fs	Fs	Fs	Fs
WWD	/xcxx	Wellwood	Fst	Fs	Fs	Fs	Fa
WWD	/1dxx	Wellwood	Pt	Fs	Fs	Fs	Fa
XVI		Xavier	Vsw	Vsw	Vsw	Vsw	Vaw

TABLE 7. SUITABILITY RATINGS OF SOILS FOR SELECTED ENGINEERING USES

Map Symbol and Phase		Soil Name	Top Soil	Sand & Gravel	Road Fill	Permanent Bldgs. With Basements	Local Roads and Streets	Sanitary Trench	Landfill Area	Cover Material	Sewage Lagoons	Septic Fields
AIZ		Arizona	Vbs	Fa	G	G	G	Vs	Pk	Vs	Vak	Gg
ASB		Assiniboine	Psi	Va	Pal	Pi	Pai	Pis	Pi	Ps	Vi	Vk
ATN		Altamont	Fs	Va	Fa	Fa	Fa	Fs	G	Fs	Fk	Fk
ATN	/xcxx	Altamont	Fs	Va	Fa	Fa	Fa	Fs	G	Fs	Fkt	Fk
ATN	/xdxx	Altamont	Fst	Va	Fa	Fa	Fa	Fs	G	Fs	Pt	Fk
ATN	/xdlx	Altamont	Fst	Va	Fa	Fa	Fa	Fs	G	Fs	Pt	Fk
ATN	/ldlx	Altamont	Fst	Va	Fa	Fa	Fa	Fs	G	Fs	Pt	Fk
ATN	/xexx	Altamont	Pt	Va	Fa	Fat	Fat	Fs	Ft	Fst	Vt	Fkt
ATN	/lexx	Altamont	Pt	Va	Fa	Fat	Fat	Fs	Ft	Fst	Vt	Fkt
BKA		Birkenhead	Ps	G	G	G	G	Vks	Vk	Vs	Vk	Gg
BKA	/xcxx	Birkenhead	Ps	G	G	G	G	Vks	Vk	Vs	Vk	Gg
BKR		Basker	Pi	Va	Pw	Vi	Vi	Vi	Viw	Pw	Vi	Vi
BNE		Bone	G	Va	Fw	Pw	Fw	Pw	Fw	G	Ph	Ph
BNE	/xcxx	Bone	G	Va	Fw	Pw	Fw	Pw	Fw	G	Ph	Ph
CAV		Carvey	Fs	Faq	Pw	Pw	Pw	Vwg	Vhk	Pw	Vk	Vhg
CAV1		Carvey	Fs	Faq	Pw	Pw	Pw	Vwg	Vkh	Pw	Vk	Vhg
CCS		Cactus	Pbs	Fa	G	G	G	Vsk	Vk	Vs	Vk	Gg
CCS	/xcxx	Cactus	Pbs	Fa	G	G	G	Vsk	Vk	Vs	Vk	Gg
CKD		Crookdale	Fsb	Paq	Fw	Pw	Fwa	Vs	Pk	Fs	Pa	Fkh
CXF		Carroll	Fb	Va	Fa	Fa	Fa	Fs	G	Fs	Fk	Fk
CXF	/xcxx	Carroll	Fbs	Va	Fa	Fa	Fa	Fs	G	Fs	Fkt	Fk
CXT		Capell	Fbs	Fq	Fw	Pw	Fw	Vsk	Vkg	Pd	Vk	Phg
CXT1		Capell	Fbs	Fq	Fw	Pw	Fw	Vsk	Vkg	Pd	Vk	Phg
CXT1	/xcxx	Capell	Fbs	Fq	Fw	Pw	Fw	Vsk	Vkg	Pd	Vk	Phg
CXV		Charman	Fsb	Va	Faw	Pw	Faw	Pw	Fw	Fs	Fa	Ph
CXV	/xcxx	Charman	Fsb	Va	Faw	Pw	Faw	Pw	Fw	Fs	Fat	Ph
CYN		Croyon	Fbs	Fq	G	G	G	Vsk	Vk	Pd	Vka	Gg
CYN	/xcxx	Croyon	Fbs	Fq	G	G	G	Vsk	Vk	Pd	Vka	Gg
CYN	/xdxx	Croyon	Fts	Fq	G	G	G	Vsk	Vk	Pd	Vka	Gg
CYN1	/xcxx	Croyon	Fb	Fq	G	G	G	Vsk	Vk	Pd	Vka	Gg

TABLE 7. SUITABILITY RATINGS OF SOILS FOR SELECTED ENGINEERING USES

Map Symbol and Phase	Soil Name	Top Soil	Sand & Gravel	Road Fill	Permanent Bldgs. With Basements	Local Roads and Streets	Sanitary Trench	Landfill Area	Cover Material	Sewage Lagoons	Septic Fields
CYN1 /xdxx	Croyon	Ftb	Fq	G	G	G	Vs	Pk	Pd	Vka	Gg
DGF /xclx	Darlingford	Fs	Va	Fa	Fa	Fa	Fs	G	Fs	Fkt	Fk
DGF /xdxx	Darlingford	Ft	Va	Fa	Fa	Fa	Fs	G	Fs	Pt	Fk
DGF /xdlx	Darlingford	Ft	Va	Fa	Fa	Fa	Fs	G	Fs	Pt	Fk
DGF /2dxx	Darlingford	Vb	Va	Fa	Fa	Fa	Fs	G	Fs	Pt	Fk
DLN	Danlin	Fs	Va	Faw	Pw	Fw	Pw	Fw	Fs	Fa	Ph
DOB	Dobbin	Ps	Fa	G	G	G	Pk	Pk	Fs	Pk	Gg
DOB /1xxx	Dobbin	Ps	Fa	G	G	G	Pk	Pk	Fs	Pk	Gg
DOB /xcxx	Dobbin	Ps	Fa	G	G	G	Pk	Pk	Fs	Pk	Gg
DOB /1cxx	Dobbin	Ps	Fa	G	G	G	Pk	Pk	Fs	Pk	Gg
DOB /2cxx	Dobbin	Pbs	Fa	G	G	G	Pk	Pk	Fs	Pk	Gg
DOB /xdxx	Dobbin	Ps	Fa	G	G	G	Pk	Pk	Fs	Pkt	Gg
DOB /1dxx	Dobbin	Ps	Fa	G	G	G	Pk	Pk	Fs	Pkt	Gg
DOB /2dxx	Dobbin	Pbs	Fa	G	G	G	Pk	Pk	Fs	Pkt	Gg
DOB /xexx	Dobbin	Pst	Fa	G	Ft	Ft	Pk	Pk	Fts	Vt	Ft
DOB /1exx	Dobbin	Ps	Pa	G	Ft	Ft	Pk	Pk	Ft	Vt	Ft
DOB /xfxx	Dobbin	Vt	Fa	Ft	Pt	Pt	Pk	Pkt	Pt	Vt	Pt
DOB /1fxx	Dobbin	Vt	Fa	Ft	Pt	Pt	Pk	Pkt	Pt	Vt	Pt
DOT /2elx	Dorset	Vb	G	G	Ft	Ft	Vsk	Vkg	Vs	Vtk	Ft
DRN /xcxx	Durnan	Fb	Va	Fa	Fa	Fa	G	G	G	Fat	Fk
DXM	Druxman	Fs	Fq	Fw	Pw	Fw	Vsg	Vkg	Fs	Vkg	Phg
DZW	Dezwood	Fs	Va	Fa	Fa	Fa	Fs	G	Fs	Fk	Fk
DZW /xcxx	Dezwood	Fs	Va	Fa	Fa	Fa	Fs	G	Fs	Fkt	Fk
DZW /xclx	Dezwood	Fs	Va	Fa	Fa	Fa	Fs	G	Fs	Fkt	Fk
DZW /1cxx	Dezwood	Fs	Va	Fa	Fa	Fa	Fs	G	Fs	Fkt	Fk
DZW /1clx	Dezwood	Fs	Va	Fa	Fa	Fa	Fs	G	Fs	Fkt	Fk
DZW /2clx	Dezwood	Pb	Va	Fa	Fa	Fa	Fs	G	Fs	Fkt	Fk
DZW /xdxx	Dezwood	Fst	Va	Fa	Fa	Fa	Fs	G	Fs	Pt	Fk
DZW /xdlx	Dezwood	Fst	Va	Fa	Fa	Fa	Fs	G	Fs	Pt	Fk
DZW /1dxx	Dezwood	Fst	Va	Fa	Fa	Fa	Fs	G	Fs	Pt	Fk

TABLE 7. SUITABILITY RATINGS OF SOILS FOR SELECTED ENGINEERING USES

Map Symbol and Phase	Soil Name	Top Soil	Sand & Gravel	Road Fill	Permanent Bldgs. With Basements	Local Roads and Streets	Sanitary Trench	Landfill Area	Cover Material	Sewage Lagoons	Septic Fields
DZW /1d1x	Dezwood	Fst	Va	Fa	Fa	Fa	Fs	G	Fs	Pt	Fk
DZW /2dxx	Dezwood	Pb	Va	Fa	Fa	Fa	Fs	G	Fs	Pt	Fk
DZW /2d1x	Dezwood	Pb	Va	Fa	Fa	Fa	Fs	G	Fs	Pt	Fk
DZW /3d1x	Dezwood	Vb	Va	Fa	Fa	Fa	Fs	G	Fs	Pt	Fk
DZW /xexx	Dezwood	Pt	Va	Fa	Fat	Fat	Fs	Ft	Fts	Vt	Fkt
DZW /xe1x	Dezwood	Pt	Va	Fa	Fat	Fat	Fs	Ft	Fts	Vt	Fkt
DZW /xe2x	Dezwood	Pt	Va	Fa	Fat	Fat	Fs	Ft	Ftp	Vt	Fkt
DZW /1exx	Dezwood	Ptb	Va	Fa	Fat	Fat	Fs	Ft	Fts	Vt	Fkt
DZW /1e1x	Dezwood	Pbt	Va	Fa	Fat	Fat	Fs	Ft	Fst	Vt	Fkt
DZW /1e2x	Dezwood	Ptb	Va	Fa	Fat	Fat	Fs	Ft	Fts	Vt	Fkt
DZW /2exx	Dezwood	Ptb	Va	Fa	Fat	Fat	Fs	Ft	Fts	Vt	Fkt
DZW /2e1x	Dezwood	Ptb	Va	Fa	Fat	Fat	Fs	Ft	Fts	Vt	Fkt
DZW /3e1x	Dezwood	Vb	Va	Fa	Fat	Fat	Fs	Ft	Fts	Vt	Fkt
DZW /xfxx	Dezwood	Vt	Va	Fat	Pt	Pt	Fst	Pt	Pt	Vt	Pt
DZW /xf1x	Dezwood	Vt	Va	Fat	Pt	Pt	Fst	Pt	Pt	Vt	Pt
DZW /xf2x	Dezwood	Vt	Va	Fat	Pt	Pt	Ftp	Pt	Pt	Vt	Pt
DZW /1f2x	Dezwood	Vt	Va	Fat	Pt	Pt	Ftp	Pt	Pt	Vt	Pt
DZW /2f1x	Dezwood	Vt	Va	Fat	Pt	Pt	Fst	Pt	Pt	Vt	Pt
DZW /2f2x	Dezwood	Vt	Va	Fat	Pt	Pt	Ftp	Pt	Pt	Vt	Pt
DZW /xf3x	Dezwood	Vt	Va	Ftp	Pt	Pt	Fst	Pt	Ptp	Vt	Pt
DZW /1gxx	Dezwood	Vt	Va	Pt	Vt	Vt	Pt	Vt	Vt	Vt	Vt
ERX	Eroded Slope Compl	Vt	Va	Pt	Vt	Vt	Pt	Vt	Vt	Vt	Vt
FFR	Fifere	Fb	Va	Fa	Fa	Fa	Pk	Pk	Fs	Fk	Fk
FFR /xcxx	Fifere	Pbs	Va	Fa	Fa	Fa	Pk	Pk	Fs	Ft	Fk
FFR /1cxx	Fifere	Vb	Va	Fa	Fa	Fa	Pk	Pk	Fs	Ft	Fk
FFR /xdxx	Fifere	Vb	Va	Fa	Fa	Fa	Pk	Pk	Fs	Pt	Fk
FFR /xd1x	Fifere	Vb	Va	Fa	Fa	Fa	Pk	Pk	Fs	Pkt	Fk
FFR /1dxx	Fifere	Vb	Va	Fa	Fa	Fa	Pk	Pk	Fs	Pt	Fk
FFR /2dxx	Fifere	Vb	Va	Fa	Fa	Fa	Pk	Pk	Fs	Pkt	Fk
FFR /2d1x	Fifere	Vb	Va	Fa	Fa	Fa	Pk	Pk	Fs	Pkt	Fk

TABLE 7. SUITABILITY RATINGS OF SOILS FOR SELECTED ENGINEERING USES

Map Symbol and Phase	Soil Name	Top Soil	Sand & Gravel	Road Fill	Permanent Bldgs. With Basements	Local Roads and Streets	Sanitary Trench	Landfill Area	Cover Material	Sewage Lagoons	Septic Fields
FFR /xexx	Fifere	Vb	Va	Fa	Fat	Fat	Pk	Pk	Fst	Vt	Fkt
FFR /xelx	Fifere	Vb	Va	Fa	Fat	Fat	Pk	Pk	Fst	Vt	Fkt
FFR /lexx	Fifere	Vb	Va	Fa	Fat	Fat	Pk	Pk	Fst	Vt	Fkt
FFR /lelx	Fifere	Vb	Va	Fa	Fat	Fat	Pk	Pk	Fst	Vt	Fkt
FFR /2elx	Fifere	Vb	Va	Fa	Fat	Fat	Pk	Pk	Fst	Vt	Fkt
FFR /xfxx	Fifere	Vbt	Va	Fat	Pt	Pt	Pk	Ptk	Pt	Vt	Pt
FFR /xflx	Fifere	Vbt	Va	Fat	Pt	Pt	Pk	Pkt	Pt	Vt	Pt
FFR /xf2x	Fifere	Vbt	Va	Fat	Pt	Pt	Pk	Pkt	Pt	Vt	Pt
FFR /xf3x	Fifere	Vbt	Va	Fat	Ptp	Pt	Pk	Pkt	Ptp	Vt	Pt
FIR	Firdale	Fs	Va	Fa	Fa	Fa	Fs	G	Fs	Fa	Fk
FIR /xcxx	Firdale	Fs	Va	Fa	Fa	Fa	Fs	G	Fs	Fat	Fk
FIR /xdxx	Firdale	Fst	Va	Fa	Fa	Fa	Fs	G	Fs	Pt	Fk
FIR /ldxx	Firdale	Fst	Va	Fa	Fa	Fa	Fs	G	Fs	Pt	Fk
FIR /xexx	Firdale	Pt	Va	Fa	Fat	Fat	Fs	Ft	Fst	Vt	Fkt
FIR /lexx	Firdale	Pt	Va	Fa	Fat	Fat	Fs	Ft	Fst	Vt	Fkt
FIR /2exx	Firdale	Pt	Va	Fa	Fat	Fat	Fs	Ft	Fst	Vt	Fkt
FIR /xfxx	Firdale	Vt	Va	Fta	Pt	Pt	Fst	Pt	Pt	Vt	Pt
FND	Fairland	G	Va	Fa	Fa	Fa	G	G	G	Fak	Fk
FND /xcxx	Fairland	G	Va	Fa	Fa	Fa	G	G	G	Fat	Fk
FND /0cxx	Fairland	G	Va	Fa	Fa	Fa	G	G	G	Fat	Fk
FND /2cxx	Fairland	Pb	Va	Fa	Fa	Fa	G	G	G	Fat	Fk
FND /xdxx	Fairland	Ft	Va	Fa	Fa	Fa	G	G	G	Pt	Fk
FND /ldxx	Fairland	Fbt	Va	Fa	Fa	Fa	G	G	G	Pt	Fk
FND /3dxx	Fairland	Vb	Va	Fa	Fa	Fa	G	G	G	Pt	Fk
FND /xexx	Fairland	Pt	Va	Fa	Fat	Fat	G	Ft	Ft	Vt	Ftk
FND /lexx	Fairland	Pt	Va	Fa	Fat	Fat	G	Ft	Ft	Vt	Ftk
FND /2exx	Fairland	Pt	Va	Fa	Fat	Fat	G	Ft	Ft	Vt	Fkt
FND /xfxx	Fairland	Vt	Va	Fat	Pt	Pt	Ft	Pt	Pt	Vt	Pt
FND /lfxx	Fairland	Vt	Va	Fat	Pt	Pt	Ft	Pt	Pt	Vt	Pt
FND /3fxx	Fairland	Vbt	Va	Fat	Pt	Pt	Ft	Pt	Pt	Vt	Pt

TABLE 7. SUITABILITY RATINGS OF SOILS FOR SELECTED ENGINEERING USES

Map Symbol and Phase	Soil Name	Top Soil	Sand & Gravel	Road Fill	Permanent Bldgs. With Basements	Local Roads and Streets	Sanitary Trench	Landfill Area	Cover Material	Sewage Lagoons	Septic Fields
FND /xgxx	Fairland	Vt	Va	Pt	Vt	Vt	Pt	Vt	Vt	Vt	Vt
FRS	Ferris	Fbs	Va	Faw	Pw	Faw	Pw	Fw	Fs	Fk	Fk
FRS /xcxx	Ferris	Fsb	Va	Faw	Pw	Faw	Pw	Fw	Fs	Fkt	Fk
GBO	Glenboro	G	Pa	G	G	G	Pk	G	G	Pka	Gg
GBO /xcxx	Glenboro	G	Pa	G	G	G	Pk	G	G	Pka	Gg
GBO /1cxx	Glenboro	Fb	Pa	G	G	G	Pk	G	G	Pka	Gg
GBO /xdxx	Glenboro	Ft	Pa	G	G	G	Pk	G	G	Pkt	Gg
GBO /1dxx	Glenboro	Ftb	Pa	G	G	G	Pk	G	G	Pkt	Gg
GRO	Grover	G	Paq	G	Pw	Fw	Pw	Fw	G	Pka	Fh
GRO /xcxx	Grover	G	Paq	G	Pw	Fw	Pw	Fw	G	Pka	Fh
GRR	Guerra	Fs	Va	Vh	Vh	Pw	Vw	Vh	Pw	Vh	Vh
GRRp	Guerra	G	Va	Vwa	Vhw	Vw	Vhw	Vhw	Vw	Vh	Vh
GVS	Gervais	Pi	Va	Faw	Piw	Fiw	Piw	Pi	Fs	Pi	Phi
GVS /xcxx	Gervais	Pi	Va	Faw	Piw	Fiw	Piw	Pi	Fs	Pi	Phi
GYS	Grayson	G	Ph	Pw	Pw	Pw	Vw	Pw	Pw	Ph	Ph
HAT	Halstead	G	Va	Fa	Fa	Fa	Pk	Pk	G	G	G
HAT /xcxx	Halstead	G	Va	Fa	Fa	Fa	Pk	Pk	G	Ft	G
HAT /3cxx	Halstead	Vb	Va	Fa	Fa	Fa	Pk	Pk	G	Ft	G
HAT /xdxx	Halstead	Ft	Va	Fa	Fa	Fa	Pk	Pk	G	Pt	G
HAT /1dxx	Halstead	Ft	Va	Fa	Fa	Fa	Pk	Pk	G	Pt	G
HAT /2dxx	Halstead	Pb	Va	Fa	Fa	Fa	Pk	Pk	G	Pt	G
HAT /xexx	Halstead	Pt	Va	Fa	Fat	Fat	Pk	Pk	Ft	Vt	Ft
HAT /1exx	Halstead	Pt	Va	Fa	Fat	Fat	Pk	Pk	Ft	Vt	Ft
HAT /2exx	Halstead	Pbt	Va	Fa	Fat	Fat	Pk	Pk	Ft	Vt	Ft
HAT /3exx	Halstead	Vb	Va	Fa	Fat	Fat	Pk	Pk	Ft	Vt	Ft
HAT /xfxx	Halstead	Vt	Va	Ft	Pt	Pt	Pk	Pkt	Pt	Vt	Pt
HAT /3fxx	Halstead	Vbt	Va	Fat	Pt	Pt	Pk	Pkt	Pt	Vt	Pt
HAT /xgxx	Halstead	Vt	Va	Pt	Vt	Vt	Ptk	Vt	Vt	Vt	Vt
HAT /xhxx	Halstead	Vt	Va	Vt	Vt	Vt	Vt	Vt	Vt	Vt	Vt
HEB	Hebbot	Fs	Va	Fa	Fa	Fa	Fs	G	Fs	Fk	Fk

TABLE 7. SUITABILITY RATINGS OF SOILS FOR SELECTED ENGINEERING USES

Map Symbol and Phase	Soil Name	Top Soil	Sand & Gravel	Road Fill	Permanent Bldgs. With Basements	Local Roads and Streets	Sanitary Trench	Landfill Area	Cover Material	Sewage Lagoons	Septic Fields
HHF	Hochfeld	G	Va	Fa	Fa	Fa	Pk	Pk	G	Pk	G
HIT /2dlx	Hilton	Pb	Va	Fa	Fa	Fa	Fa	G	Fs	Pt	Fk
HIT /xelx	Hilton	Pt	Va	Fa	Fat	Fat	Fa	Ft	Fst	Vt	Fkt
HIT /3flx	Hilton	Vtb	Va	Fat	Pt	Pt	Fa	Pt	Pt	Vt	Pt
HKS	Hickson	Fs	Va	Vh	Vh	Pw	Vw	Vh	Pw	Fa	Vh
HMO	Hummerston	Ps	Pa	Fw	Pw	Fw	Vsk	Vk	Vs	Vk	Ph
HMO /xcxx	Hummerston	Ps	Pa	Fw	Pw	Fw	Vsk	Vk	Vs	Vk	Ph
HOS	Horose	Fs	Va	Vh	Pw	Pw	Vhw	Vh	Pw	Fk	Vh
HRG	Harding	Ps	Va	Pa	Paw	Pa	Ps	Fw	Ps	G	Pk
JAY	Jaymar	Fbs	Paq	Fa	Fa	Fa	Pkg	Pkg	Pq	Pg	Fkg
JAY /xcxx	Jaymar	Fbs	Paq	Fa	Fa	Fa	Pkg	Pkg	Pq	Pkg	Fkg
JAY /2exx	Jaymar	Pbt	Paq	Fa	Fat	Fat	Pkg	Pkg	Pq	Vt	Fkt
JIK	Janick	Ps	Va	Pa	Pa	Pa	Ps	G	Ps	G	Vk
JIK /xcxx	Janick	Ps	Va	Pa	Pa	Pa	Ps	G	Ps	Ft	Vk
JIK /xdxx	Janick	Ps	Va	Pa	Pa	Pa	Ps	G	Ps	Pt	Vk
JYL	Joyale	Fs	Va	Faw	Pw	Faw	Pw	Fw	Fs	Fk	Fhk
JYL /xxxs	Joyale	Pn	Va	Faw	Pw	Faw	Pw	Fw	Fs	Fk	Fhk
JYL /xxxt	Joyale	Vn	Va	Faw	Pw	Faw	Ph	Fw	Fs	Fk	Fhk
JYL /xcxx	Joyale	Fs	Va	Faw	Pw	Faw	Pw	Fw	Fs	Fkt	Fhk
KIS /xfxx	Kingsley	Vt	Va	Fat	Pt	Pt	Fst	Pt	Pt	Vt	Pt
KUD	Knudson	Fs	Va	Fa	Fa	Fa	Fs	G	Fs	Fk	Fk
KUD /xcxx	Knudson	Fs	Va	Fa	Fa	Fa	Fs	G	Fs	Fkt	Fk
KUD /xdxx	Knudson	Fst	Va	Fa	Fa	Fa	Fs	G	Fs	Pt	Fk
KUD /2dxx	Knudson	Pb	Va	Fa	Fa	Fa	Fs	G	Fs	Pt	Fk
KUD /xexx	Knudson	Pt	Va	Fa	Fat	Fat	Fs	Ft	Fst	Vt	Fkt
KUD /xelx	Knudson	Pt	Va	Fa	Fat	Fat	Fs	Ft	Fst	Vt	Fkt
LEI	Levine	Fis	Va	Faw	Piw	Pi	Pi	Pi	Fs	Vi	Pi
LEI /xcxx	Levine	Fis	Va	Faw	Piw	Pi	Pi	Pi	Fs	Vi	Pi
LEI /xdxx	Levine	Fst	Va	Faw	Piw	Pi	Pi	Pi	Fs	Vi	Pi
LRY	Leary	Ps	G	G	G	G	Vsk	Vk	Vs	Vk	Gg

TABLE 7. SUITABILITY RATINGS OF SOILS FOR SELECTED ENGINEERING USES

Map Symbol and Phase	Soil Name	Top Soil	Sand & Gravel	Road Fill	Permanent Bldgs. With Basements	Local Roads and Streets	Sanitary Trench	Landfill Area	Cover Material	Sewage Lagoons	Septic Fields
LRY /xcxx	Leary	Ps	G	G	G	G	Vsk	Vk	Vs	Vk	Gg
LRY /xc1x	Leary	Ps	G	G	G	G	Vsk	Vk	Vs	Vk	Gg
LRY /xdxx	Leary	Ps	G	G	G	G	Vsk	Vk	Vs	Vk	Gg
LRY /xd1x	Leary	Ps	G	G	G	G	Vsk	Vk	Vs	Vk	Gg
LRY /1dxx	Leary	Ps	G	G	G	G	Vsk	Vk	Vs	Vk	Gg
LRY /1d1x	Leary	Ps	G	G	G	G	Vsk	Vk	Vs	Vk	Gg
LRY1 /xdxx	Leary	Ps	G	G	G	G	Vsk	Vk	Vs	Vk	Gg
LRY1 /xd1x	Leary	Ps	G	G	G	G	Vsk	Vk	Vs	Vk	Gg
LRY1 /1dxx	Leary	Ps	G	G	G	G	Vsk	Vk	Vs	Vk	Gg
LRY1 /1d1x	Leary	Ps	G	G	G	G	Vsk	Vk	Vs	Vk	Gg
LRY /xexx	Leary	Pst	G	G	Ft	Ft	Vsk	Vk	Vs	Vkt	Ftg
LRY /xe1x	Leary	Pst	G	G	Ft	Ft	Vsk	Vk	Vs	Vkt	Ftg
LRY /1e1x	Leary	Pst	G	G	Ft	Ft	Vsk	Vk	Vs	Vkt	Ftg
LRY /1e2x	Leary	Pst	G	G	Ftp	Ft	Vsk	Vk	Vs	Vkt	Ftg
LRY /2exx	Leary	Vb	G	G	Ft	Ft	Vsk	Vk	Vs	Vkt	Ftg
LRY /2e1x	Leary	Vb	G	G	Ft	Ft	Vsk	Vk	Vs	Vkt	Ftg
LRY /3e1x	Leary	Vb	G	G	Ft	Ft	Vsk	Vk	Vs	Vkt	Ftg
LRY1 /xe1x	Leary	Pst	G	G	Ft	Ft	Vsk	Vk	Vs	Vkt	Ftg
LRY1 /1exx	Leary	Pst	G	G	Ft	Ft	Vsk	Vk	Vs	Vkt	Ftg
LRY1 /2exx	Leary	Vb	G	G	Ft	Ft	Vsk	Vk	Vs	Vkt	Ftg
LRY1 /3e1x	Leary	Vb	G	G	Ft	Ft	Vsk	Vk	Vs	Vkt	Ftg
LRY /xfxx	Leary	Vt	G	Ft	Pt	Pt	Vsk	Vk	Vs	Vkt	Ptg
LRY /xf1x	Leary	Vt	G	Ft	Pt	Pt	Vsk	Vk	Vs	Vkt	Ptg
LRY /1fxx	Leary	Vt	G	Ft	Pt	Pt	Vsk	Vk	Vs	Vkt	Ptg
LRY /2f1x	Leary	Vtb	G	Ft	Pt	Pt	Vsk	Vk	Vs	Vkt	Ptg
LRY /3f2x	Leary	Vtb	G	Ft	Pt	Pt	Vsk	Vk	Vs	Vkt	Ptg
LSL	La Salle	Fis	Va	Fa	Pi	Fia	Pi	Pi	Fs	Pi	Pi
LSL /0cxx	La Salle	Fis	Va	Fa	Pi	Fia	Pi	Pi	Fs	Pi	Pi
LSL /xcxx	La Salle	Fis	Va	Fa	Pi	Fia	Pi	Pi	Fs	Pi	Pi
LSL /xc2x	La Salle	Fip	Va	Fa	Pi	Fia	Pi	Pi	Fsp	Pi	Pi

TABLE 7. SUITABILITY RATINGS OF SOILS FOR SELECTED ENGINEERING USES

Map Symbol and Phase	Soil Name	Top Soil	Sand & Gravel	Road Fill	Permanent Bldgs. With Basements	Local Roads and Streets	Sanitary Trench	Landfill Area	Cover Material	Sewage Lagoons	Septic Fields
LSL1 /xcxx	La Salle	Ps	Pa	G	Pi	Fi	Pi	Pi	Fs	Vk	Pi
LSL /xdxx	La Salle	Fst	Va	Fa	Pi	Fia	Pi	Pi	Fs	Pi	Pi
LSR	Landseer	Ps	Va	Paw	Paw	Paw	Vw	Pw	Psw	Fh	Vk
LSR /xxxs	Landseer	Pns	Va	Paw	Paw	Paw	Vw	Pw	Psw	Fh	Vk
LSR /xxxu	Landseer	Vn	Va	Paw	Paw	Paw	Vw	Pw	Psw	Fh	Vk
LVH	Lavenham	Ps	Fa	Fw	Pw	Fw	Vks	Vk	Vs	Vk	Ph
LVH /xcxx	Lavenham	Ps	Fa	Fw	Pw	Fw	Vsk	Vk	Vs	Vk	Ph
LVH /lcxx	Lavenham	Ps	Fa	Fw	Pw	Fw	Vsk	Vk	Vs	Vk	Ph
LWN	Lowton	Ps	Va	Pw	Pw	Pw	Vw	Pw	Fsw	G	Vk
MDN /xxxu	Marsden	Vn	Pa	Pw	Vh	Pw	Vwg	Vhg	Pw	Vhg	Vhg
MHC	Marsh Complex	Vw	Va	Vw	Vw	Vw	Vw	Vw	Vw	Vh	Vh
MKY	Mockry	Ps	Ph	Pw	Pw	Pw	Vw	Vk	Vs	Vk	Vh
MKYp	Mockry	Pb	Ph	Pw	Pw	Pw	Vwk	Vk	Vs	Vk	Vh
MOW	Mowbray	Pb	Va	Fa	Fa	Fa	Fis	Fi	Fs	Fa	Fk
MOW /xcxx	Mowbray	Pb	Va	Fa	Fa	Fa	Fis	Fi	Fs	Fat	Fk
MOW /xdxx	Mowbray	Fit	Va	Fa	Fa	Fa	Fis	Fi	Fs	Pt	Fk
MRH	Marringhurst	Psb	G	G	G	G	Vsk	Vkg	Vs	Vk	Gg
MRH /xclx	Marringhurst	Ps	G	G	G	G	Vsk	Vk	Vs	Vk	Gg
MRH1 /3cxx	Marringhurst	Vb	G	G	G	G	Vsk	Vk	Vs	Vk	Gg
MXT	Melland	Fsb	Pa	Faw	Pw	Fw	Pwg	Pkg	Pq	Pkg	Fkg
MXT /xxxu	Melland	Vn	Pa	Faw	Pw	Fw	Pwg	Pkg	Pq	Pkg	Fkg
NKK /xcxx	Nikkel	Fs	Va	Faw	Pw	Faw	Pw	Fw	Fs	Fkt	Fhk
NKK /xdxx	Nikkel	Fts	Va	Faw	Pw	Faw	Pw	Fw	Fs	Pt	Fhk
NSH	Narish	Fs	Va	Vh	Vh	Pw	Vw	Vh	Pw	Vh	Vh
NYO /xcxx	Nayler	Vb	Va	Fa	Fa	Fa	Pk	Pgk	Fs	Pk	G
NYO /xdxx	Nayler	Vb	Va	Fa	Fa	Fa	Pk	Pgk	Fs	Pkt	G
NYO /xexx	Nayler	Vb	Va	Fa	Fat	Fat	Pk	Pgk	Fst	Vt	Ft
NYO /lexx	Nayler	Vb	Va	Fa	Fat	Fat	Pk	Pgk	Fst	Vt	Ft
NYO /xfxx	Nayler	Vt	Va	Fat	Pt	Pt	Pk	Pgk	Pt	Vt	Pt
NYO /lfxx	Nayler	Vt	Va	Fat	Pt	Pt	Pk	Pgk	Pt	Vt	Pt

TABLE 7. SUITABILITY RATINGS OF SOILS FOR SELECTED ENGINEERING USES

Map Symbol and Phase		Soil Name	Top Soil	Sand & Gravel	Road Fill	Permanent Bldgs. With Basements	Local Roads and Streets	Sanitary Trench	Landfill Area	Cover Material	Sewage Lagoons	Septic Fields
NYO	/xf3x	Nayler	Vt	Va	Ftp	Ptp	Pt	Pkp	Pgk	Ptp	Vt	Pt
OBR		Oberon	Fsb	Paq	Fw	Pw	Fwa	Vs	Pk	Fs	Pa	Fkh
OIV		Oliver	Fb	Va	Fw	Paw	Faw	Pws	Pk	Ps	Fa	Pkh
OIV	/xxxs	Oliver	Psn	Va	Fw	Paw	Faw	Pws	Pk	Ps	Fa	Pkh
OIV	/xxxt	Oliver	Vn	Va	Fw	Paw	Faw	Pws	Pk	Ps	Fa	Pkh
OIV	/xxxu	Oliver	Vn	Va	Fw	Paw	Faw	Pws	Pk	Ps	Fa	Pkh
OLK		Ollneck	Fs	Va	Faw	Pw	Faw	Ph	Fw	Fs	Fk	Pk
OLK	/xcxx	Ollneck	Fs	Va	Faw	Pw	Faw	Ph	Fw	Fs	Fkt	Pk
ONH		Onahan	Ps	Fa	Fw	Pw	Fw	Vk	Vk	Fs	Vk	Fh
ONH	/xcxx	Onahan	Ps	Fa	Fw	Pw	Fw	Vk	Vk	Fs	Vk	Fh
ONH	/xdxx	Onahan	Pst	Fa	Fw	Pw	Fwt	Pkw	Pkw	Fs	Pkt	Fh
ONH	/xexx	Onahan	Pst	Fa	Fw	Pw	Fwt	Pkw	Pkw	Fs	Vkt	Fht
PBI	/xdxx	Pembina	Fst	Va	Fa	Fa	Fa	Fs	G	Fs	Pt	Fk
PBI	/xexx	Pembina	Pt	Va	Fa	Fat	Fat	Fs	Ft	Fst	Vt	Fkt
PBI	/2exx	Pembina	Pbt	Va	Fa	Fat	Fat	Fs	Ft	Fst	Vt	Fkt
PBI	/2elx	Pembina	Pbt	Va	Fa	Fat	Fat	Fs	Ft	Fst	Vt	Fkt
PBI	/3elx	Pembina	Vbt	Va	Fa	Fat	Fat	Fs	Ft	Fst	Vt	Fkt
PBI	/xfxx	Pembina	Vt	Va	Fat	Pt	Pt	Fst	Pt	Pt	Vt	Pt
PBI	/xglx	Pembina	Vt	Va	Pt	Vt	Vt	Pt	Vt	Vt	Vt	Vt
PDA		Prodan	Fs	Va	Faw	Pw	Faw	Pw	Fw	Fs	Fk	Ph
PDA	/xxxs	Prodan	Pn	Va	Faw	Pw	Faw	Pw	Fw	Fs	Fk	Ph
PDA	/xxxt	Prodan	Vn	Va	Faw	Pw	Faw	Pw	Fw	Fs	Fk	Ph
PDA	/xxxu	Prodan	Vn	Va	Faw	Pw	Faw	Pw	Fw	Fs	Fk	Ph
PDA	/xcxx	Prodan	Fs	Va	Faw	Pw	Faw	Pw	Fw	Fs	Fkt	Ph
PER		Perillo	G	Va	Vaw	Vaw	Vaw	Vsw	Vw	Vsw	Vah	Vh
PERd		Perillo	G	Va	Vah	Vaw	Vaw	Vsw	Vw	Vsw	Vah	Vh
PPR		Poplar Point	Pb	Va	Faw	Piw	Pif	Vi	Vi	Fs	Vi	Pi
PPR	/xcxx	Poplar Point	Pb	Va	Faw	Piw	Pif	Vi	Vi	Fs	Vi	Pi
PTR		Petrel	G	Pqa	G	Pw	Fw	Pw	Fw	G	Pka	Fh
RAM		Ramada	Fs	Va	Fa	Fa	Fa	Fs	G	Fs	Fk	Fk

TABLE 7. SUITABILITY RATINGS OF SOILS FOR SELECTED ENGINEERING USES

Map Symbol and Phase	Soil Name	Top Soil	Sand & Gravel	Road Fill	Permanent Bldgs. With Basements	Local Roads and Streets	Sanitary Trench	Landfill Area	Cover Material	Sewage Lagoons	Septic Fields
RAM /0cxx	Ramada	Fs	Va	Fa	Fa	Fa	Fs	G	Fs	Fkt	Fk
RAM /xcxx	Ramada	Fs	Va	Fa	Fa	Fa	Fs	G	Fs	Fkt	Fk
RAM /xdxx	Ramada	Fts	Va	Fa	Fa	Fa	Fs	G	Fs	Pt	Fk
RAM /1dxx	Ramada	Fst	Va	Fa	Fa	Fa	Fs	G	Fs	Pt	Fk
RAM /2dxx	Ramada	Fst	Va	Fa	Fa	Fa	Fs	G	Fs	Pt	Fk
RAM /xexx	Ramada	Pt	Va	Fa	Fat	Fat	Fs	Ft	Fst	Vt	Fkt
RAM /1exx	Ramada	Pt	Va	Fa	Fat	Fat	Fs	Ft	Fst	Vt	Fkt
RAM /2exx	Ramada	Pt	Va	Fa	Fat	Fat	Fs	Ft	Fst	Vt	Fkt
RMP	Rempel	Fs	Va	Fa	Fa	Fa	Fs	G	Fs	Fk	Fk
SCK	Stockton	Ps	Fa	G	G	G	Vsk	Vk	Vs	Vk	Gg
SCK /0xxx	Stockton	Ps	Fa	G	G	G	Vks	Vk	Vs	Vk	Gg
SCK /1xxx	Stockton	Ps	Fa	G	G	G	Vsk	Vk	Vs	Vk	Gg
SCK /xcxx	Stockton	Ps	Fa	G	G	G	Vsk	Vk	Vs	Vk	Gg
SCK /0cxx	Stockton	Ps	Fa	G	G	G	Vsk	Vk	Vs	Vk	Gg
SCK /1cxx	Stockton	Ps	Fa	G	G	G	Vsk	Vk	Vs	Vk	Gg
SCK /2cxx	Stockton	Psb	Fa	G	G	G	Vsk	Vk	Vs	Vk	Gg
SCK /3cxx	Stockton	Vb	G	G	G	G	Vsk	Vk	Vs	Vk	Gg
SCK /xdxx	Stockton	Ps	Fa	G	G	G	Vsk	Vk	Vs	Vk	Gg
SCK /1dxx	Stockton	Ps	Fa	G	G	G	Vsk	Vk	Vs	Vk	Gg
SCK /2dxx	Stockton	Psb	Fa	G	G	G	Vsk	Vk	Vs	Vk	Gg
SCK /xexx	Stockton	Vt	Fa	G	Ft	Ft	Vsk	Vk	Vs	Vkt	Ftg
SCK /1exx	Stockton	Pst	Fa	G	Ft	Ft	Vsk	Vk	Vs	Vkt	Ftg
SCK /xfxx	Stockton	Vt	Fa	Ft	Pt	Pt	Vsk	Vk	Vs	Vkt	Ptg
SCK /xgxx	Stockton	Vt	G	Pt	Vt	Vt	Vsk	Vkt	Vst	Vkt	Vtg
SEE	Sewell	Ps	Fa	Pw	Pw	Pw	Vw	Pw	Pw	Vkh	Vh
SEEp	Sewell	Ps	Ph	Vw	Vw	Pw	Vwh	Vw	Vsw	Vhk	Vh
SEU /xfxx	Shellmouth Complex	Vbt	Va	Fat	Pt	Pt	Pk	Pkt	Pt	Vt	Pt
SGO /xcxx	Sigmund	Ps	Va	Pa	Paw	Pa	Ps	Fw	Ps	Ft	Pk
SGO /xxxt	Sigmund	Vn	Va	Pa	Paw	Pa	Ps	Fw	Ps	G	Pk
SHX	Shilox	Vb	G	G	G	G	Vks	Vk	Vs	Vk	Gg

TABLE 7. SUITABILITY RATINGS OF SOILS FOR SELECTED ENGINEERING USES

Map Symbol and Phase	Soil Name	Top Soil	Sand & Gravel	Road Fill	Permanent Bldgs. With Basements	Local Roads and Streets	Sanitary Trench	Landfill Area	Cover Material	Sewage Lagoons	Septic Fields
SHX /xcxx	Shilox	Vb	G	G	G	G	Vks	Vk	Vs	Vk	Gg
SHX /xdxx	Shilox	Vb	G	G	G	G	Vks	Vk	Vs	Vk	Gg
SHX /1dxx	Shilox	Vb	G	G	G	G	Vks	Vk	Vs	Vk	Gg
SHX /xexx	Shilox	Vb	G	G	Ft	Ft	Vks	Vk	Vs	Vkt	Ftg
SHX /xfxx	Shilox	Vbt	G	Ft	Pt	Pt	Vks	Vk	Vs	Vkt	Ptg
SHX /1fxx	Shilox	Vtb	G	Ft	Pt	Pt	Vks	Vk	Vs	Vkt	Ptg
SHX /xgxx	Shilox	Vtb	G	Pt	Vt	Vt	Vks	Vkt	Vst	Vkt	Vtg
SHX /xhxx	Shilox	Vtb	G	Vt	Vt	Vt	Vkt	Vkt	Vst	Vkt	Vtg
SXP	Sutton	Fs	Fq	Pw	Pw	Pw	Vhw	Pw	Pwg	Pah	Ph
SXPp	Sutton	Vw	Fq	Vw	Pw	Pw	Vhw	Vw	Pwg	Pah	Ph
TDP	Tadpole	Vw	Va	Vhw	Vwh	Pw	Vhw	Vhw	Vw	Vh	Vh
TDP /xxxs	Tadpole	Pn	Va	Pw	Vwh	Pw	Vw	Pw	Pw	Fa	Vh
TDP /xxxt	Tadpole	Vn	Va	Pw	Pw	Pw	Vw	Pw	Pw	Fa	Vh
TDP /xxxu	Tadpole	Vn	Va	Pw	Vwh	Pw	Vw	Pw	Pw	Fa	Vh
TDP /xx3t	Tadpole	Vn	Va	Pw	Pwp	Pw	Vw	Pw	Pw	Fap	Vh
TDP /xcxx	Tadpole	Fs	Va	Pw	Pw	Pw	Vw	Pw	Pw	Fa	Vh
TDPd	Tadpole	Fs	Va	Pw	Pw	Pw	Vw	Pw	Pw	Fa	Vh
TDPp	Tadpole	Vw	Va	Vhw	Vwh	Pw	Vhw	Vhw	Vw	Fa	Vh
TDPp /xxxs	Tadpole	Pns	Va	Vhw	Vwh	Pw	Vhw	Vhw	Vw	Vh	Vh
TGL /2clx	Tiger Hills	Pb	Va	Fa	Fa	Fa	Fs	G	Fs	Fkt	Fk
TGL /2exx	Tiger Hills	Pbt	Va	Fa	Fat	Fat	Fs	Ft	Fst	Vt	Fkt
TGL /2f2x	Tiger Hills	Vt	Va	Fat	Pt	Pt	Fsp	Pt	Pt	Vt	Pt
TGR	Taggart	G	Va	Faw	Pw	Faw	Pw	Fw	G	Fak	Ph
TGR /xcxx	Taggart	G	Va	Faw	Pw	Faw	Pw	Fw	G	Fkt	Ph
TLI	Tellier	Fs	Va	Faw	Pw	Faw	Pw	Fw	Fs	Fk	Fk
TLI /xcxx	Tellier	Fs	Va	Faw	Pw	Faw	Pw	Fw	Fs	Fkt	Fk
TOC	Torcan	G	Va	Faw	Pw	Faw	Pw	Fw	G	Fak	Ph
ULH	Ullrich	Fs	Va	Faw	Pw	Faw	Pw	Fw	Fs	Fk	Fhk
ULH /xxxs	Ullrich	Pn	Va	Faw	Pw	Faw	Pw	Fw	Fs	Fk	Fhk
ULH /xxxt	Ullrich	Vn	Va	Faw	Pw	Faw	Pw	Fw	Fs	Fk	Fhk

TABLE 7. SUITABILITY RATINGS OF SOILS FOR SELECTED ENGINEERING USES

Map Symbol and Phase	Soil Name	Top Soil	Sand & Gravel	Road Fill	Permanent Bldgs. With Basements	Local Roads and Streets	Sanitary Trench	Landfill Area	Cover Material	Sewage Lagoons	Septic Fields
ULH /xcxx	Ullrich	Fs	Va	Faw	Pw	Faw	Pw	Fw	Fs	Fkt	Fhk
VDL /xcxx	Vandal	Fs	Faq	G	G	G	Vsk	Vk	Pd	Vka	Gg
VDL /xdxx	Vandal	Fs	Faq	G	G	G	Vsk	Vk	Pd	Vka	Gg
VDL1	Vandal	Fs	Faq	G	G	G	Vsk	Vk	Pd	Vka	Gg
VDL1 /xcxx	Vandal	Fs	Faq	G	G	G	Vsk	Vk	Pd	Vka	Gg
VDL1 /xdxx	Vandal	Ft	Faq	G	G	G	Vsk	Vk	Pd	Vka	Gg
VDL1 /xd1x	Vandal	Ft	Faq	G	G	G	Vsk	Vk	Pd	Vka	Gg
VDS	Vordas	G	Va	Pw	Pw	Pw	Vw	Pw	Pw	Vh	Vh
VDSp	Vordas	Vw	Va	Vw	Vh	Vi	Vw	Vw	Vw	Vh	Vhi
VTL	Vartel	Fb	Faq	Fwa	Pw	Fwa	Vsk	Vk	Fs	Vka	Fhg
VTL1	Vartel	Fb	Faq	Fwa	Pw	Fwa	Vsk	Vk	Pd	Vka	Ph
WIK /xcxx	Winkler	Ps	Va	Pal	Pa	Pa	Ps	G	Ps	Ft	Pk
WWB	Willowbend	Pw	Va	Pw	Vi	Vi	Vi	Vi	Vw	Vi	Vi
WWBp	Willowbend	Vbw	Va	Vw	Vi	Vi	Vi	Vi	Vw	Vi	Vi
WWD	Wellwood	Fs	Fq	Fa	G	Fa	Pk	Gg	Fs	Pkg	Fk
WWD /2xxx	Wellwood	Pb	Fq	Fa	G	Fa	Pk	Gg	Fs	Pkg	Fk
WWD /xcxx	Wellwood	Fs	Fq	Fa	G	Fa	Pk	Gg	Fs	Pkg	Fk
WWD /1dxx	Wellwood	Fst	Fq	Fa	G	Fa	Pk	Gg	Fs	Pkt	Fk
XVI	Xavier	G	Va	Va	Vaw	Vaw	Vsw	Vw	Vsw	Vah	Vh

Appendix A

GLOSSARY

AASHO classification (soil engineering) - The official classification of soil materials and soil aggregate mixtures for highway construction used by the American Association of State Highway Officials.

Acid soil - A soil having a pH less than 7. See pH and Reaction, soil.

Alkaline soil - A soil having a pH greater than 7. See Reaction, soil.

Alluvium - A general term for all deposits of rivers and streams.

Arable soil - Soil suitable for plowing and cultivation.

Association - A sequence of soils of about the same age, derived from similar parent material, and occuring under similar climatic conditions but showing different characteristics due to variations in relief and in drainage.

1/3 Atmosphere Moisture - The moisture percentage on dry weight basis of a soil sample that has been air dried, screened, saturated and subjected to a soil moisture tension of 345 cm of water through a permeable membrane for a period of 48 hours. It approximates the soil moisture retention capacity.

Available nutrient - That portion of any element or compound in the soil that can be readily absorbed and assimilated by growing plants.

Available soil moisture - The portion of water in a soil that can be readily absorbed by plant roots: generally considered to be that water held in the soil up to approximately 15 atmospheres pressure.

Bearing capacity - Capacity of soil (in moist to wet conditions) to support loads such as buildings, people, vehicles, and animals.

Bedrock - The solid rock that underlies soil and regolith or that is exposed at the surface.

Boulders - Stones which are larger than 60 cm in diameter.

Bulk density - The weight of oven dry soil (105 degrees C) divided by its volume at field moisture conditions, expressed in grams per cubic centimeter.

Buried soil - Soil covered by an alluvial, loessial, or other deposit, usually to a depth greater than the thickness of the solum.

Calcareous soil - Soil containing sufficient calcium carbonate (often with magnesium carbonate) to effervesce visibly when treated with hydrochloric acid.

Calcium Carbonate Equivalent - Refers to the percent of carbonates in the soil expressed on the basis of calcium carbonate. Terms used to express the carbonate contents of soils are:

noncalcareous	<1%
weakly calcareous	1-5%
moderately calcareous	.6-15%
strongly calcareous	16-25%
v. strongly calcareous	26-40%
extremely calcareous	>40%

Capillary fringe - A zone of essentially saturated soil just above the water table. The size distribution of the pores determines the extent and degree of the capillary fringe.

Carbon-nitrogen ratio (C/N ratio) - The ratio of the weight of organic carbon to the weight of total nitrogen in a soil or in an organic material.

Cation Exchange Capacity (CEC) - A measure of the total amount of exchangeable cations that can be held by a soil. Expressed in milliequivalents per 100g of soil.

Clay - As a soil separate, the mineral soil particles less than 0.002 mm in diameter: usually consisting largely of clay minerals. As a soil textural class, soil materials that contain 40 or more percent clay, less than 45 percent sand and less than 40 percent silt.

Cobbles - Rock fragments 8 to 25 cm in diameter.

Color - Soil colors are compared with a Munsell color chart. The Munsell system specifies the relative degrees of the three simple variables of color: hue, value and chroma. For example: 10YR 6/4 means a hue of 10YR, a value of 6, and a chroma of 4.

Complex (soil) - A mapping unit used in detailed and reconnaissance soil surveys where two or more soil series that are so intimately intermixed in an area that it is impractical to separate them at the scale of mapping used.

Concretions - Hard grains, pellets or nodules from concentration of compounds in the soil that cement soil grains together.

Conductivity, electrical - A physical quantity that measures the readiness with which a medium (irrigation water and soil extracts) transmits electricity. It expresses the concentration of salt in terms of the conductance (reciprocal of the electric resistance in ohms) in milliSiemens per cm (or expressed as deciSiemens per meter - dS/m).

Consistence (soil) - The mutual attraction of the particles in a soil mass, or their resistence to separation or deformation. It is described in terms such as loose, soft, friable, firm, hard, sticky, plastic or cemented.

Consumptive use factor (CU) - The ratio of consumptive use of water by a crop to potential evapotranspiration. and transpiration. An actively growing crop that completely covers the soil over a large area and that has an ample supply of readily available soil water has a consumptive use factor of 1.0.

Consumptive use of water - The sum of the depths of water transpired by the plants and evaporated from the soil surface and from intercepted precipitation. It may be less or greater than potential evapotranspiration.

Contour - An imaginary line connecting points of equal elevation on the surface of the soil.

Cover - This term generally has one of the following meanings:

1. Vegetation or other material providing protection
2. In forestry, low growing shrubs and herbaceous plants under trees (i.e., ground cover vs. tree cover)
3. Any vegetation producing a protective mat on or just above the soil surface.

Creep (soil) - Slow mass movement of soil and soil material down rather steep slopes primarily under the influence of gravity, but aided by saturation with water and by alternate freezing and thawing.

Decile portion - A one-tenth portion. As used in the soil map symbol A7-B3 means that the A soils cover seven tenths and the B soils cover three tenths of the map unit.

Delta - A fluvial or glaciofluvial fan shaped deposit at the mouth of a river that empties into a lake or sea.

Deflocculate - To separate or to break up soil aggregates into individual particles by chemical or physical means or both.

Degradation (of soils) - The changing of a soil to a more highly leached and more highly weathered condition, usually accompanied by morphological changes such as the development of an eluviated light colored (Ae) horizon.

Dispersion - Is rated high, moderate or low depending on how readily the soil structure breaks down or slakes because of excess moisture. A rating of high indicates that soil aggregates slake readily; a rating of low indicates that aggregates are resistant to dispersion and remain clumped together.

Drainage (soil) - (1) The rapidity and extent of the removal of water from the soil by runoff and flow through the soil to underground spaces. (2) As a condition of the soil, it refers to the frequency and duration of periods when the soil is free of saturation.

Drainage in soil reports is described on the basis of actual moisture content in excess of field capacity and length of the saturation period within the plant root zone. The terms are as follows:

Very rapidly drained - Water is removed from the soil very rapidly in relation to supply. Excess water flows downward very rapidly if underlying material is pervious. There may be very rapid subsurface flow during heavy rainfall provided there is a steep gradient. Soils have very low available water storage capacity (usually less than 2.5 cm) within the control section and are usually coarse in texture, or shallow, or both. Water source is precipitation.

Rapidly drained - Water is removed from the soil rapidly in relation to supply. Excess water flows downward if underlying material is pervious. Subsurface flow may occur on steep gradients during heavy rainfall. Soils have low available water storage capacity (2.5-4 cm) within the control section, and are usually coarse in texture, or shallow, or both. Water source is precipitation.

Well drained - Water is removed from the soil readily but not rapidly. Excess water flows downward readily into underlying pervious material or laterally as subsurface flow. Soils have intermediate available water storage capacity (4-5 cm) within the control section, and are generally intermediate in texture and depth. Water source is precipitation. On slopes subsurface flow may occur for short durations but additions are equaled by losses. These soils are usually free of mottles within 100 cm of the surface but may be mottled below this depth. Soil horizons are usually bright colored.

Moderately well drained - Water is removed from the soil somewhat slowly in relation to supply. Excess water is removed somewhat slowly due to low perviousness, shallow water table, lack of gradient, or some combination of these. Soils have intermediate to high water storage capacity (5-6cm) within the control section and are usually medium to fine in texture. Soils are commonly mottled in the 50 to 100 cm depth. Colors are dull brown in the subsoil with stains and mottles.

Imperfectly drained - Water is removed from the soil sufficiently slowly in relation to supply to keep the soil wet for a significant part of the growing season. Excess water moves slowly downward if precipitation is major supply. If subsurface water or groundwater, or both, is the main source, flow rate may vary but the soil remains wet for a significant part of the growing season. Precipitation is the main source if available water storage capacity is high; contribution by subsurface flow or groundwater flow, or both, increases as available water storage capacity decreases. Soils have a wide range in available water supply, texture, and depth, and are gleyed phases of well drained subgroups. These soils generally have mottling below the surface layers and generally have duller colors with depth, generally brownish gray with mottles of yellow and gray.

Poorly drained - Water is removed so slowly in relation to supply that the soil remains wet for a comparatively large part of the time the soil is not frozen. Excess water is evident in the soil for a large part of the time. Subsurface flow or groundwater flow, or both, in addition to precipitation are main water sources; there may also be a perched water table, with precipitation exceeding evapotranspiration. Poorly drained soils have a wide range in available water storage capacity, texture, and depth, and are gleyed subgroups, Gleysols, and Organic soils.

Very poorly drained - Water is removed from the soil so slowly that the water table remains at or on the surface for the greater part of the time the soil is not frozen. Excess water is present in the soil for the greater part of the time. Groundwater flow and subsurface flow are major water sources. Precipitation is less important except where there is a perched water table with precipitation exceeding evapotranspiration. These soils have a wide range in available water storage capacity, texture, and depth, and are either Gleysolic or Organic.

Dryland farming - The practice of crop production in low rainfall areas without irrigation.

Eluvial horizon - A horizon from which material has been removed in solution or in water suspension.

Eolian - Soil material accumulated through wind action.

Erosion - The wearing away of the land surface by detachment and transport of soil and rock material through the action of moving water, wind or other geological processes. The ratings of erosion are:

Erosion 1	slightly eroded - soil with a sufficient amount of the A horizon removed that ordinary tillage will bring up and mix the B horizon or other lower lying horizons with surface soil in the plow layer.
Erosion 2	moderately eroded - soil with all of the A horizon and a part of the B or other lower lying horizons removed. The plow layer consists mainly of the original horizons below the A or below the original plow layer.
Erosion 3	severely eroded - soils have practically all of the original surface soil removed. The plow layer consists mainly of C horizon material, especially on knolls and steep upper slope positions.

Evapotranspiration - The combined loss of water from a given area, and during a specific period of time, by evaporation from the soil surface and transpiration from plants.

Field Moisture Equivalent - The minimum moisture content at which a drop of water placed on a smoothed surface of the soil will not be absorbed immediately by the soil, but will spread out over the surface and give it a shiny appearance.

Flood plain - The land bordering a stream, built up of sediments from overflow of the stream and subject to inundation when the stream is at flood stage.

Fluvial deposits - All sediments past and present, deposited by flowing water, including glaciofluvial deposits.

Frost heave - The raising of the surface caused by ice in the subsoil.

Friable - Soil aggregates that are soft and easily crushed between thumb and forefinger.

Glaciofluvial deposits - Material moved by glaciers and subsequently sorted and deposited by streams flowing from the melting ice. These deposits are stratified and may occur in the form of outwash plains, deltas, kames, eskers and kame terraces.

Gleyed soil - An imperfectly or poorly drained soil in which the material has been modified by reduction or alternating reduction and oxidation. These soils have lower chromas or more prominent mottling or both in some horizons than the associated well-drained soil.

Gleysolic - An order of soils developed under wet conditions and permanent or periodic reduction. These soils have low chromas or prominent mottling or both, in some horizons.

Gravel - Rock fragments 2 mm to 7.5 cm in diameter.

Ground Moraine - An unsorted mixture of rocks, boulders, sand, silt and clay deposited by glacial ice. The predominant material is till; most till is thought to have accumulated under the ice by lodgment, but some till has been let down from the upper surface of the ice by ablation. Resorting and modification may have taken place to some extent by wave-action of glacial melt waters. The topography is most commonly in the form of undulating plains with gently sloping hills and enclosed depressions.

Groundwater - Water beneath the soil surface, usually under conditions where the voids are completely filled with water (saturation).

Halophytic vegetation - vegetation that grows naturally in soils having a high content of various salts. It usually has fleshy leaves or thorns and resembles desert vegetation.

Horizon (soil) - A layer in the soil profile approximately parallel to the land surface with more or less well-defined characteristics that have been produced through the operation of soil forming processes.

Horizon boundary - The lower boundary of each horizon is described by indicating its distinctness and form. The distinctness depends on the abruptness of vertical change (thickness). The form refers to the variation of the boundary plane.

Distinctness -
abrupt - less than 2 cm
clear - 2 to 5 cm
gradual - 5 to 15 cm
diffuse - more than 15 cm

Form -
smooth - nearly plain
wavy - pockets are wider than deep
irregular - pockets are deeper than wide
broken - parts of the horizon are unconnected with other parts

Humic layer - A layer of highly decomposed organic soil material containing little fibre.

Hydraulic Conductivity - Refers to the effective flow velocity or discharge velocity in soil at unit hydraulic gradient. It is an approximation of the permeability of the soil and is expressed in cm per hour. The classes are described in general or specific terms as:

High	>15	Very rapid	>50
		Rapid	15-50
Medium	0.5-15	Mod. rapid	5.0-15
		Moderate	1.5-5.0
		Mod. slow	0.5-1.5
Low	<0.5	Slow	0.15-0.5
		Very slow	0.015-0.15
		Extremely slow	<.015

Hydrologic cycle - The conditions through which water naturally passes from the time of precipitation until it is returned to the atmosphere by evaporation and is again ready to be precipitated.

Hydrophyte - Plants growing in water or dependent upon wet or saturated soil conditions for growth.

Illuvial horizon - A soil horizon in which material carried from an overlying layer has been precipitated from solution or deposited from suspension. The layer of accumulation.

Impeded drainage - A condition that hinders the movement of water by gravity through the soils.

Inclusion - Soil type found within a mapping unit that is not extensive enough to be mapped separately or as part of a complex.

Infiltration - The downward entry of water into the soil

Irrigation - The artificial application of water to the soil for the benefit of growing crops.

Irrigation requirement (IR) - Refers to the amount of water exclusive of effective precipitation that is required for crop production.

Lacustrine deposits - Material deposited by or settled out of lake waters and exposed by lowering of the water levels or elevation of the land. These sediments range in texture from sand to clay and are usually varved (layered annual deposits).

Landforms - See Description of Landforms

Landscape - All the natural features such as fields, hills, forest, water, etc., which distinquish one part of the earth's surface from another part.

Leaching - The removal from the soil of materials in solution.

Liquid limit (upper plastic limit) - The water content corresponding to an arbitrary limit between the liquid and plastic states of consistency of a soil. The water content at this boundary is defined as that at which a pat of soil cut by a groove of standard dimensions will flow together for a distance of 1.25 cm under the impact of 25 blows in a standard liquid limit apparatus.

Lineal shrinkage - This is the decrease in one dimension expressed as a percentage of the original dimension of the soil mass when the moisture content is reduced from a stipulated percentage (usually field moisture equivalent) to the shrinkage limit.

Mapping Unit - Any delineated area shown on a soil map that is identified by a symbol. A mapping unit may be a soil unit, a miscellaneous land type, or a soil complex.

Marsh - Periodically flooded or continually wet areas having the surface not deeply submerged. It is covered dominantly with sedges, cattails, rushes or other hydrophytic plants.

Mature soil - A soil having well-developed soil horizons produced by the natural processes of soil formation.

Mesophyte - Plants requiring intermediate moisture conditions and are not very resistant to drought.

Microrelief - Small-scale, local differences in relief including mounds, swales or hollows.

Milliequivalent (me) - One-thousandth of an equivalent. An equivalent is the weight in grams of an ion or compound that combines with or replaces one gram of hydrogen. The atomic or formula weight divided by valence.

Mottles - Irregularly marked spots or streaks, usually yellow or orange but sometimes blue. They are described in order of abundance (few, common, many), size (fine, medium, coarse) and contrast (faint, distinct, prominent). Mottles in soils indicate poor aeration and lack of good drainage.

Organic carbon - Carbon derived from plant and animal residues.

Organic matter - The fraction of the soil which consists of plant and animal residues at various stages of decomposition, cells and tissues of soil organisms and substances synthesized by the soil population. It is determined on soils that have been sieved through a 2.0 mm sieve. It is estimated by multiplying the organic carbon by a factor of 1.72.

Outwash - Sediments "washed out" beyond the glacier by flowing water and laid down in thin beds or strata. Particle size may range from boulders to silt.

Ovendry soil - Soil that has been dried at 105 degrees C until it has reached constant weight.

Parent material - The unaltered or essentially unaltered mineral or organic material from which the soil profile develops by pedogenic processes.

Particle size, soil - The grain size distribution of the whole soil including the coarse fraction. It differs from texture, which refers to the fine earth (less than 2mm) fraction only. In addition, textural classes are usually assigned to specific horizons whereas soil family particle-size classes indicate a composite particle size of a part of the control section that may include several horizons. See Textural Triangle at end of Glossary.

The particle-size classes for family groupings are as follows:

Fragmental Stones, cobbles and gravel, with too little fine earth to fill interstices larger than 1 mm.

Sandy-skeletal Particles coarser than 2 mm occupy 35% or more by volume with enough fine earth to fill interstices larger than 1 mm; the fraction finer than 2 mm is that defined for the sandy particle-size class.

Loamy-skeletal Particles 2 mm-25 cm occupy 35% or more by volume with enough fine earth to fill interstices larger than 1 mm; the fraction finer than 2 mm is that defined for the loamy particle-size class.

Clayey-skeletal Particles 2 mm-25 cm occupy 35% or more by volume with enough fine earth to fill interstices larger than 1 mm; the fraction finer than 2 mm is that defined for the clayey particle-size class.

Sandy The texture of the fine earth includes sands and loamy sands, exclusive of loamy very fine sand and very fine sand textures; particles 2 mm- 25 cm occupy less than 35% by volume.

Loamy The texture of the fine earth includes loamy very fine sand, very fine sand, and finer textures with less than 35% clay; particles 2 mm-25 cm occupy less than 35% by volume.

Coarse-loamy. A loamy particle size that has 15% or more by weight of fine sand (0.25-0.1 mm) or coarser particles, including fragments up to 7.5 cm, and has less than 18% clay in the fine earth fraction.

Fine-loamy. A loamy particle size that has 15% or more by weight of fine sand (0.25-0.1 mm) or coarser particles, including fragments up to 7.5 cm, and has 18-35% clay in the fine earth fraction.

Coarse-silty. A loamy particle size that has less than 15% of fine sand (0.25-0.1 mm) or coarser particles, including fragments up to 7.5 cm, and has less than 18% clay in the fine earth fraction.

Fine-silty. A loamy particle size that has less than 15% of fine sand (0.25-0.1 mm) or coarser particles, including fragments up to 7.5 cm, and has 18-35% clay in the fine earth fraction.

Clayey. The fine earth contains 35% or more clay by weight and particles 2mm-25 cm occupy less than 35% by volume.

Fine-clayey. A clayey particle size that has 35-60% clay in the fine earth fraction.

Very-fine-clayey. A clayey particle size that has 60% or more clay in the fine earth fraction.

Ped - An individual soil aggregate such as granule, prism or block formed by natural processes (in contrast with a clod which is formed artificially).

Pedology - Those aspects of soil science involving constitution, distribution, genesis and classification of soils.

Percolation - The downward movement of water through soil; specifically, the downward flow of water in saturated or nearly saturated soil at hydraulic gradients of 1.0 or less.

Permafrost -

1. Perennially frozen material underlying the solum.

2. A perennially frozen soil horizon.

Permafrost table - The upper boundary of permafrost, usually coincident with the lower limit of seasonal thaw (active layer).

Permeability - The ease with which water and air pass through the soil to all parts of the profile. See hydraulic conductivity.

pH - The intensity of acidity and alkalinity, expressed as the negative logarithm of the hydrogen ion concentration. A pH of 7 is neutral, lower values indicate acidity and higher values alkalinity (see Reaction, soil).

Phase, soil - A soil phase is used to characterize soil and landscape properties that are not used as criteria in soil taxonomy. The major phase differentiae are: slope, erosion, deposition, stoniness, texture, salinity, and calcareousness.

Plastic Limit - The water content corresponding to an arbitrary limit between the plastic and the semisolid states of consistency of a soil.

Plasticity Index - The numerical difference between the liquid and the plastic limit. The plasticity index gives the range of moisture contents within which a soil exhibits plastic properties.

Potential evapotranspiration (PE) - The maximum quantity of water capable of being lost as water vapor, in a given climate, by a continuous stretch of vegetation covering the whole ground and well supplied with water.

Profile, soil - A vertical section of the soil through all its horizons and extending into the parent material.

Reaction, soil - The acidity or alkalinity of a soil. Soil reaction classes are characterized as follows:

extremely acid	pH <4.5
very strongly acid	4.5 to 5.0
strongly acid	5.1 to 5.5
medium acid	5.6 to 6.0
slightly acid	6.1 to 6.5
neutral	6.6 to 7.3
mildly alkaline	7.4 to 7.8
mod. alkaline	7.9 to 8.4
strongly alkaline	8.5 to 9.0
very strongly alkaline	>9.0

Regolith - The unconsolidated mantle of weathered rock and soil material on the earth's surface.

Relief - The elevation of inequalities of the land surface when considered collectively.

Runoff - The portion of the total precipitation on an area that flows away through stream channels. Surface runoff does not enter the soil. Groundwater runoff or seepage flow from groundwater enters the soil before reaching the stream.

Saline Soil - A nonalkali soil containing soluble salts in such quantities that they interfere with the growth of most crop plants. The conductivity of the saturation extract is greater than 4 millisiemens/cm (ms/cm), the exchangeable-sodium percentage is less than 15, and the pH is usually less than 8.5. Approximate limits of salinity classes are:

non-saline	0 to 4 ms/cm
weakly saline	4 to 8 mS/cm
mod. saline	8 to 15 ms/cm
strongly saline	>15 ms/cm

Salinization - The process of accumulation of salts in the soil.

Salt-Affected Soil - Soil that has been adversely modified for the growth of most crop plants by the presence of certain types of exchangeable ions or of soluble salts. It includes soils having an excess of salts, or an excess of exchangeable sodium or both.

Sand - A soil particle between 0.05 and 2.0 mm in diameter. The textural class name for any soil containing 85 percent or more of sand and not more than 10 percent of clay.

Saturation Percentage - The moisture percentage of a saturated soil paste, expressed on an oven dry weight basis.

Seepage -

1. The escape of water downward through the soil.

2. The emergence of water from the soil along an extensive line of surface in contrast to a spring where water emerges from a local spot.

Series, soil - A category in the Canadian System of Soil Classification. It consists of soils that have soil horizons similar in their differentiating characteristics and arrangement in the profile, except for surface texture and are formed from a particular type of parent material.

Shrinkage limit - This is the moisture content at which an equilibrium condition of volume change is reached and further reduction in moisture content will not cause a decrease in the volume of the soil mass.

Shrinkage ratio - This is the ratio between the volume change and a corresponding change in moisture content. It equals the apparent specific gravity of the dried soil.

Silt - (a) Individual mineral particles of soil that range in diameter between 0.05 to .002 mm. (b) Soil of the textural class silt contains greater than 80 percent silt and less than 12 percent clay.

Slickenside - Smoothed surfaces along planes of weakness resulting from the movement of one mass of soil against another in soils dominated by swelling clays.

Sodium-Adsorption Ratio (S.A.R.) - A ratio for soil extracts and irrigation waters used to express the relative activity of sodium ions in exchange reactions with other cations in the soil SAR = $Na/((Ca+Mg)/2)^{1/2}$ where the cation concentrations are expressed as milliequivalents per litre.

Soil - The unconsolidated mineral material on the immediate surface of the earth that serves as a natural medium for the growth of land plants. Soil has been subjected to and influenced by genetic and environmental factors of: parent material, climate (including moisture and temperature effects), macro- and micro-organisms, and topography, all acting over a period of time.

Solum - The upper horizons of a soil above the parent material and in which the processes of soil formation are active. It usually comprises the A and B horizons.

Stones - Rock fragments greater than 25 cm in diameter.

Stoniness - The percentage of land surface occupied by stones. The classes of stoniness are defined as follows:

Stones 0. Nonstony -- Land having less than 0.01% of surface occupied by stones.

Stones 1. Slightly stony -- Land having 0.01-0.1% of surface occupied by stones. Stones 15-30 cm in diameter, 10-30 m apart. The stones offer only slight to no hindrance to cultivation.

Stones 2. Moderately stony -- Land having 0.1-3% of surface occupied by stones. Stones 15-30 cm in diameter, 2-10 m apart. Stones cause some interference with cultivation.

Stones 3. Very stony -- Land having 3-15% of surface occupied by stones. Stones 15-30 cm in diameter, 1-2 m apart. There are sufficient stones to constitute a serious handicap to cultivation.

Stones 4. Exceedingly stony -- Land having 15-50% of surface occupied by stones. Stones 15-30 cm in diameter, 0.7-1.5 m apart. There are sufficient stones to prevent cultivation until considerable clearing has been done.

Stones 5. Excessively stony -- Land having more than 50% of surface occupied by stones. Stones 15-30 cm in diameter, less than 0.7 m apart. The land is too stony to permit cultivation.

Storage Capacity - Refers to the maximum amount of readily available water that can be stored within the rooting zone of a crop in a given soil. For practical irrigation purposes, 50 percent of the total soil water between field capacity and wilting point may be considered as readily available.

Stratified materials - Unconsolidated sand, silt and clay arranged in strata or layers. In stratified materials, a bed is a unit layer distinctly separable from other layers and is one or more cm thick but a lamina is a similar layer less than 1 cm thick.

Structure - The combination or arrangement of primary soil particles into aggregates of secondary soil particles, units or peds, which are separated from each other by surfaces of weakness. Structure is expressed in terms of grade, size class and shape type. Grade refers to the distinctness of aggregate development, and is described as structureless, weak, moderate or strong. Structureless refers to the absence of observable aggregation of definite orderly arrangement; the term amorphous is used if soil is massive or coherent, single-grained if noncoherent. The weak to strong aggregates vary in size and are described by class as fine, medium, coarse, and very coarse depending on the shape types. The shape types refers to the dominant configuration of the aggregates and the way they are accommodated. The general shape types are plate-like, block-like and prism-like. The terms are:

Platy - Having thin, plate-like aggregates with faces mostly horizontal

Prismatic - Having prism-like aggregates with tops and edges, appear plane, level and somewhat angular.

Columnar - Having prism-like aggregates with vertical edges near the top of columns, not sharp.

Granular - Having block-like aggregates that appear as spheroids or polyhedrons having plane or curved surfaces which have slight or no accommodation to the faces of the surrounding peds.

Blocky - Having block-like aggregates with sharp, angular corners

Subangular blocky - Having block-like aggregates with rounded and flattened faces and rounded corners.

By convention an aggregate is described in the order of grade, class and type, e.g. strong, medium, blocky. In the parent material of soils the material with structural shapes may be designated as pseudo-blocky, pseudoplaty, etc.

Soil Survey - The systematic examination, description, classification, and mapping of soil in an area.

Sulfate Hazard - Refers to the relative degree of attack on concrete by soil and water containing various amounts of sulfate ions. It is estimated from electrolyte measurements and salt analysis on selected profiles and soil samples, and by visual examination of free gypsum within the profile during the course of soil investigation.

Swamp - See Description of Landforms

Texture, soil - The relative proportions of the fine earth (less than 2 mm.) fraction of a soil. Textural classes are usually assigned to specific horizons whereas family particle size classes indicate a composite particle size of a portion of the control section that may include several horizons. See Texture Triangle at end of Glossary.

The size range of the constituent primary particles are as follows:

	Diameter (mm)
Very coarse sand. . . .	.2.0-1.0
Coarse sand	.1.0-0.5
Medium sand	0.5-0.25
Fine sand	.0.25-0.10
Very fine sand. . . .	.0.10-0.05
Silt.	0.05-0.002
Clay.	.< 0.002
Fine clay	< 0.0002

Till, glacial - Unstratified glacial deposits consisting of clay, sand, gravel, and boulders intermingled in any proportion.

Tilth - The physical condition of soil as related to its ease of tillage, fitness as a seedbed, and its impedance to seedling emergency and root penetration.

Topography - Refers to the percent slope and the pattern or frequency of slopes in different directions. A set of 10 slope classes are used to denote the dominant but not necessarily most abundant slopes within a mapping unit.

Slope Class	Slope Name	Percent slope	Approx. degrees
1	level	0-0.5	0
2	nearly level	.5-2.5	.3-1.5
3	very gentle	2-5	1-3
4	gentle	6-9	3.5-5
5	moderate	10-15	6-8.5
6	strong	16-30	9-17
7	very strong	31-45	17-24
8	extreme	46-70	25-35
9	steep	71-100	35-45
10	very steep	>100	>45

Underground runoff - (or seepage)-Water flowing towards stream channels after infiltration into the ground.

Unified Soil Classification System (engineering) - A classification system based on the identification of soils according to their particle size, gradation, plasticity index and liquid limit.

Urban Land - Areas so altered or obstructed by urban works or structures that identification of soils is not feasible.

Variant, soil - A soil whose properties are believed to be sufficiently different from other known soils to justify a new series name, but comprising such a limited geographic area that creation of a new series is not justified.

Varve - A distinct band representing the annual deposit in sedimentary materials regardless of origin and usually consisting of two layers, one thick light colored layer of silt and fine sand laid down in the spring and summer, and the other a thin, dark colored layer of clay laid down in the fall and winter.

Water balance, soil - Is the daily amount of readily available water retained by the soil. The daily soil-water balance is decreased by the amount that the daily consumptive use exceeds the daily rainfall. When daily rainfall exceeds the consumptive use, the daily balance increases by the amount of the difference unless the soil-water balance is at storage capacity, in which case the excess is assumed to be lost by runoff or deep percolation.

Water table - (groundwater surface; free water surface; groundwater elevation) Elevation at which the pressure in the water is zero with respect to the atmospheric pressure.

Water-holding capacity - The ability of a soil to hold water against the force of gravity in a freely drained soil.

Weathering - The physical and chemical disintegration, alteration and decomposition of rocks and minerals at or near the earth's surface by atmospheric agents.

Xerophyte - Plants capable of surviving extended periods of soil drought.

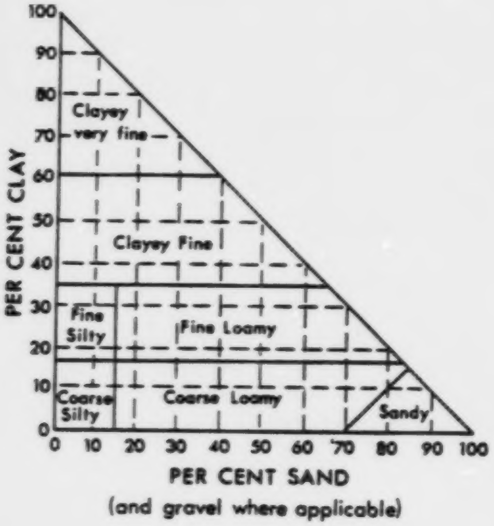
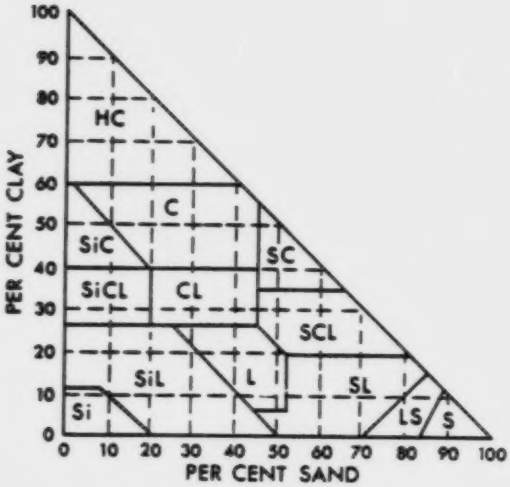

100
90
80
70
60
50
40
30
20
10
0
PER CENT CLAY
Clayey very fine
Clayey Fine
Fine Silty
Fine Loamy
Coarse Silty
Coarse Loamy
Sandy
0 10 20 30 40 50 60 70 80 90 100
PER CENT SAND
(and gravel where applicable)

Figure 5: Family particle-size classes.


100
90
80
70
60
50
40
30
20
10
0
PER CENT CLAY
HC
C
SiC
SC
SiCL
CL
SCL
SiL
L
SL
Si
LS
S
0 10 20 30 40 50 60 70 80 90 100
PER CENT SAND

Texture Group	Class Symbol	Class Name
Coarse	S	sand
	LS	loamy sand
Moderately coarse	SL	sandy loam
	LVFS	loamy very fine sand
Medium	Si	silt
	SiL	silt loam
	L	loam
	VFSL	very fine sandy loam
Moderately fine	SCL	sandy clay loam
	CL	clay loam
	SiCL	silty clay loam
Fine	SC	sandy clay
	C	clay
	SiC	silty clay
Very fine	HC	heavy clay

Figure 6: Soil Textural Classes.

Appendix B

SOIL HORIZON DESIGNATIONS

ORGANIC HORIZONS

Organic horizons are found in Organic soils, and commonly at the surface of mineral soils. They may occur at any depth beneath the surface in buried soils, or overlying geologic deposits. They contain more than 17% organic carbon (approximately 30% organic matter) by weight. Two groups of these horizons are recognized, O horizons and the L, F, and H horizons.

O This is an organic horizon developed mainly from mosses, rushes, and woody materials.

Of The fibric horizon is the least decomposed of all the organic soil materials. It has large amounts of well-preserved fiber that are readily identifiable as to botanical origin. A fibric horizon has 40% or more of rubbed fiber by volume and a pyrophosphate index of 5 or more. If the rubbed fiber volume is 75% or more, the pyrophosphate criterion does not apply.

Om The mesic horizon is the intermediate stage of decompostion with intermediate amounts of fiber, bulk density and water-holding capacity. The material is partly altered both physically and biochemically. A mesic horizon is one that fails to meet the requirements of fibric or humic.

Oh The humic horizon is the most highly decomposed of the organic soil materials. It has the least amount of fiber, the highest bulk density, and the lowest saturated water-holding capacity. It is very stable and changes very little physically or chemically with time unless it is drained. The humic horizon has less than 10% rubbed fiber by volume and a pyrophosphate index of 3 or less.

LFH These organic horizons developed primarily from leaves, twigs, woody materials and a minor component of mosses under imperfectly to well drained forest conditions.

L This is an organic horizon characterized by an accumulation of organic matter in which the original structures are easily discernible.

F This is an organic horizon characterized by an accumulation of partly decomposed organic matter. The original structures in part are difficult to recognize. The horizon may be partly comminuted by soil fauna as in moder, or it may be a partly decomposed mat permeated by fungal hyphae as in mor.

H This is an organic horizon characterized by an accumulation of decomposed organic matter in which the original structures are indiscernible. This material differs from the F horizon by its greater humification chiefly through the action of organisms. It is frequently intermixed with mineral grains, especially near the junction with the mineral horizon.

MASTER MINERAL HORIZONS

Mineral horizons are those that contain less than 30% organic matter by weight as specified for organic horizons.

A This is a mineral horizon or horizons formed at or near the surface in the zone of leaching or removal of materials in solution and suspension or of maximum in situ accumulation of organic matter, or both. Included are:

1. horizons in which organic matter has accumulated as a result of biological activity (Ah);
2. horizons that have been eluviated of clay, iron, aluminum, or organic matter, or all of them (Ae);
3. horizons having characteristics of 1) and 2) above but transitional to underlying B or C (AB or A and B);
4. horizons markedly disturbed by cultivation or pasture (Ap).

B This is a mineral horizon or horizons characterized by one or more of the following:

1. an enrichment in silicate clay, iron, aluminum, or humus, alone or in combination (Bt,Bf,Bfh,Bhf, and Bh);
2. a prismatic or columnar structure that exhibits pronounced coatings or stainings and significant amount of exchangeable Na (Bn);
3. an alteration by hydrolysis, reduction, or oxidation to give a change in color or structure from horizons above or below, or both, and does not meet the requirements of 1) and 2) above (Bm,Bg).

C This is a mineral horizon or horizons comparatively unaffected by the pedogenic processes operative in A and B, excepting (i) the process of gleying, and (ii) the accumulation of calcium and magnesium carbonates and more soluble salts (Cca,Csa,Cg, and C). Marl and diatomaceous earth are considered to be C horizons.

R This is consolidated bedrock that is too hard to break with the hands or to dig with a spade when moist and that does not meet the requirement of a C horizon. The boundary between the R layer and overlying unconsolidated material is called a lithic contact.

W This is a layer of water in Gleysolic, Organic, or Cryosolic soils. It is called a hydric layer in Organic soils.

LOWER-CASE SUFFIXES

b Buried soil horizon.

c A cemented (irreversible) pedogenic horizon. The ortstein of a Podzol, and a layer cemented by calcium carbonate and a duripan are examples.

ca A horizon with secondary carbonate enrichment where the concentration of lime exceeds that present in the unenriched parent material. It is more than 10 cm thick, and if it has a CaCO3 equivalent of less than 15 percent it should have at least 5 percent more CaCO3 equivalent than the parent material (IC). If it has more than 15 percent CaCO3 equivalent it should have 1/3 more CaCO3 equivalent than the IC. If no IC is present, this horizon is more than 10 cm thick and contains more than 5 percent by volume of secondary carbonates in concretions or soft, powdery forms.

cc Cemented (irreversible) pedogenic concretions.

e A horizon characterized by the eluviation of clay, iron, aluminum, or organic matter alone or in combination. When dry, it is usually higher in color value by 1 or more units than an underlying B horizon. It is used with A (Ae).

f A horizon enriched with amorphous material, principally Al and Fe combined with organic matter. It usually has a hue of 7.5YR or redder or its hue is 10YR near the upper boundary and becomes yellower with depth. When moist, the chroma is higher than 3 or the value is 3 or less. It contains 0.6% or more pyrophosphate-extractable Al+Fe in textures finer than sand and 0.4% or more in sands (coarse sand, sand, fine sand, and very fine sand). The ratio of pyrophosphate-extractable Al+Fe to clay (less than 0.002mm) is more than 0.05 and organic C exceeds 0.5%. Pyrophosphate-extractable Fe is at least 0.3%, or the ratio of organic C to pyrophosphate-extractable Fe is less than 20, or both are true. It is used with B alone (Bf), with B and h (Bhf), with B and g (Bfg), and with other suffixes. The criteria for "f" do not apply to Bgf horizons. The following horizons are differentiated on the basis of organic carbon content: Bf - 0.5% to 5% organic carbon. Bhf-more than 5% organic carbon.

g A horizon characterized by gray colors, or prominent mottling, or both, indicative of permanent or periodic intense reduction. Chromas of the matrix are generally 1 or less. It is used with A and e (Aeg); with B alone (Bg); with B and f (Bfg); with B, h, and f (Bhfg); with B and t (Btg); with C alone (Cg); with C and k (Ckg); and several others. In some reddish parent materials, matrix colors of reddish hues and high chromas may persist despite long periods of reduction. In these soils, horizons are designated as g if there is gray mottling or if there is marked bleaching on ped faces or along cracks.

Aeg This horizon must meet the definitions of A,e, and g.

Bg These horizons are analogous to Bm horizons but they have colors indicative of poor drainage and periodic reduction. They include horizons occurring between A and C horizons in which the main features are (i) colors of low chroma, that is: chromas of 1 or less, without mottles on ped surfaces or in the matrix if peds are lacking; or chromas of 2 or less in hues of 10YR or redder, on ped surfaces or in the matrix if peds are lacking, accompanied by more prominent mottles than those in the C horizon; or hues bluer than 10Y, with or without mottles on ped surfaces or in the matrix if peds are lacking. (ii) colors indicated in (i) and a change in structure from that of the C horizons. (iii) color indicated in (i) and illuviation of clay too slight to meet the requirements of Bt; or accumulation or iron oxide too slight to meet the limits of Bgf. (iv) colors indicated in (i) and removal of carbonates. Bg horizons occur in some Orthic Humic Gleysols and some Orthic Gleysols.

Bfg, Bhfg, Btg, and others. When used in any of these combinations the limits set for f, hf, t, and others must be met.

Bgf The dithionite-extractable Fe of this horizon exceeds that of the IC by 1% or more. Pyrophosphate-extractable Al + Fe is less than the minimum limit specified for 'f' horizons. This horizon occurs in Fera Gleysols and Fera Humic Gleysols, and possibly below the Bfg of gleyed Podzols. It is distinguished from the Bfg of gleyed Podzols on the basis of the extractability of the Fe and Al. The Fe in the Bgf horizon is thought to have accumulated as a result of the oxidation of ferrous iron. The iron oxide formed is not associated intimately with organic matter or with Al, and it is sometimes crystalline. The Bgf horizons are usually prominently mottled, with more than half of the soil material occurring as mottles of high chroma.

Cg, Ckg, Ccag, Csg, Csag. When g is used with C alone, or with C and one of the lower-case suffixes k, ca, s, or sa, it must meet the difinition for C and for the particular suffix.

h A horizon enriched with organic matter. It is used with A alone (Ah); or with A and e (Ahe); or with B alone (Bh); or with B and f (Bhf).

Ah A horizon enriched with organic matter that either has a color value at least one unit lower than the underlying horizon or contains 0.5% more organic carbon than the IC, or both. It contains less than 17% organic carbon by weight.

Ahe An Ah horizon that has undergone eluviation as evidenced, under natural conditions, by streaks and splotches of differing shades of gray and often by platy structure. It may be overlain by a darker-colored Ah and underlain by a lighter-colored Ae.

Bh This horizon contains more than 1% organic carbon, less than 0.3% pyrophosphate-extractable Fe, and has a ratio of organic carbon to pyrophosphate-extractable Fe of 20 or more. Generally the color value and chroma are less than 3 when moist.

Bhf Defined under 'f'.

j Used as a modifier of the suffixes e, f, g, n, and t to denote an expression of, but failure to meet, the specified limits of the suffix it modifies. It must be placed to the right and adjacent to the suffix it modifies. For example Bfgj means a Bf horizon with weak expression of gleying; Bfjgj means a B horizon with weak expression of both 'f' and 'g' features.

Aej It denotes an eluvial horizon that is thin, discontinuous or slightly discernible.

Btj It is a horizon with some illuviation of clay, but not enough to meet the limits of Bt.

Btgj, Bmgj. Horizons that are mottled but do not meet the criteria of Bg.

Bfj It is a horizon with some accumulation of pyrophosphate-extractable Al and Fe but not enough to meet the limits of Bf.

Bntj or Bnj. Horizons in which development of solonetzic B properties is evident but insufficient to meet the limits for Bn or Bnt.

k Denotes the presence of carbonate, as indicated by visible effervescence when dilute HCl is added. Most often it is used with B and m (Bmk) or C (Ck), and occasionally with Ah or Ap (Ahk, Apk), or organic horizons (Ofk, Omk).

m A horizon slightly altered by hydrolysis, oxidation, or solution, or all three, to give a change in color or structure, or both. It has:

1. Evidence of alteration in one of the following forms:

   a) Higher chromas and redder hues than the underlying horizons.

   b) Removal of carbonates, either partially (Bmk) or completely (Bm).

2. Illuviation, if evident, too slight to meet the requirements of a Bt or a podzolic B.

3. Some weatherable minerals.

4. No cementation or induration and lacks a brittle consistence when moist. This suffix can be used as Bm, Bmgj, Bmk, and Bms.

n A horizon in which the ratio of exchangeable Ca to exchangeable Na is 10 or less. It must also have the following distinctive morphological characteristics: prismatic or columnar structure, dark coatings on ped surfaces, and hard to very hard consistence when dry. It is used with B, as Bn or Bnt.

p A horizon disturbed by man's activities, such as cultivation, logging, habitation, etc. It is used with A and O.

s A horizon with salts, including gypsum, which may be detected as crystals or veins, as surface crusts of salt crystals, by depressed crop growth, or by the presence of salt-tolerant plants. It is commonly used with C and k (Csk), but can be used with any horizon or combination of horizon and lowercase suffix.

sa A horizon with secondary enrichment of salts more soluble than calcium and magnesium carbonates, in which the concentration of salts exceeds that present in the unenriched parent material. The horizon is 10 cm or more thick. The conductivity of the saturation extract must be at least 4 ms/cm and must exceed that of the C horizon by at least one-third.

t An illuvial horizon enriched with silicate clay. It is used with B alone (Bt), with B and g (Btg), with B and n (Bnt), etc.

Bt A Bt horizon is one that contains illuvial layer-lattice clays. It forms below an eluvial horizon, but may occur at the surface of a soil that has been partially truncated. It usually has a higher ratio of fine clay to total clay than IC. It has the following properties:

1. If any part of an eluvial horizon remains and there is no lithologic discontinuity between it and the Bt horizon, the Bt horizon contains more total and fine clay than the eluvial horizons, as follows:

    a) If any part of the eluvial horizon has less than 15% total clay in the fine earth fraction (2mm) the Bt horizon must contain at least 3% more clay, e.g.,Ae 10% clay-Bt minimum 13% clay.

    b) If the eluvial horizon has more than 15% and less than 40% total clay in the fine earth fraction, the ratio of the clay in the Bt horizon to that in the eluvial horizon must be 1.2 or more, e.g., 20% clay increase in the Bt over Ae.

    c) If the eluvial horizon has more than 40% total clay in the fine earth fraction, the Bt horizon must contain at least 8% more clay than the eluvial horizon, e.g. Ae 50% clay; Bt at least 58% clay.

2. A Bt horizon must be at least 5 cm thick. In some sandy soils where clay accumulation occurs in the lamellae, the total thickness of the lamellae should be more than 10 cm in the upper 150 cm of the profile.

3. In massive soils the Bt horizon should have oriented clays in some pores and also as bridges between the sand grains.

4. If peds are present, a Bt horizon shows clay skins on some of the vertical and horizontal ped surfaces and in the fine pores, or shows oriented clays in 1% or more of the cross section, as viewed in thin section.

5. If a soil shows a lithologic discontinuity between the eluvial

horizon and the Bt horizon, or if only a plow layer overlies the Bt horizon, the Bt horizon need show only clay skins in some part, either in some fine pores or on some vertical and horizontal ped surfaces. Thin sections should show that some part of the horizon has about 1% or more of oriented clay bodies.

Btj, Btj, and Btg are defined under j and g.

u A horizon that is markedly disrupted by physical or faunal processes other than cryoturbation. Evidence of marked disruption such as the inclusion of material from other horizons, absence of the horizon, etc. must be evident in at least half of the cross section of the pedon. Such turbation can result from blowdown of trees, mass movement of soil on slopes, and burrowing animals. It can be used with any horizon or subhorizon with the exception of A or B alone; e.g. Aeu, Bfu, BCu.

x A horizon of fragipan character. A fragipan is a loamy subsurface horizon of high bulk density and very low organic matter content. When dry, it has a hard consistence and seems to be cemented. When moist, it has moderate to weak brittleness. It frequently has bleached fracture planes and is overlain by a friable B horizon. Air dry clods of fragic horizons slake in water.

y A horizon affected by cryoturbation as manifested by disrupted and broken horizons,, incorporation of materials from other horizons and mechanical sorting in at least half of the cross section of the pedon. It is used with A, B, and C alone or in combination with other subscripts, e.g. Ahy, Ahgy, Bmy, Cy, Cgy, Cygj, etc.

z A frozen layer. It may be used with any horizon or layer, e.g. Ohz, Bmz, Cz, Wz.

Appendix C

DESCRIPTION OF LANDFORMS

C.1 GENETIC MATERIALS

Unconsolidated mineral component

The unconsolidated mineral component consists of clastic sediments that may or may not be stratified, but whose particles are not cemented together. They are essentially of glacial or post-glacial origin but include poorly consolidated and weathered bedrock.

Anthropogenic - Man-made or man-modified materials, including those associated with mineral exploitation and waste disposal.

Colluvial - Massive to moderately well stratified, nonsorted to poorly sorted sediments with any range of particle sizes from clay to boulders and blocks that have reached their present position by direct, gravity-induced movement.

They are restricted to products of mass-wasting whereby the debris is not carried by wind, water, or ice (excepting snow avalanches).

Eolian - Sediment, generally consisting of medium to fine sand and coarse silt particle sizes, that is well sorted, poorly compacted, and may show internal structures such as cross bedding or ripple laminae, or may be massive. Individual grains may be rounded and show signs of frosting.

These materials have been transported and deposited by wind action.

Fluvial - Sediment generally consisting of gravel and sand with a minor fraction of silt and clay. The gravels are typically rounded and contain interstitial sand. Fluvial sediments are commonly moderately to well sorted and display stratification, but massive, nonsorted fluvial gravels do occur. These materials have been transported and deposited by streams and rivers. Finer textured Fluvial deposits of modern rivers are termed Alluvium.

Lacustrine - Sediment generally consisting of either stratified fine sand, silt, and clay deposited on the lake bed; or moderately well sorted and stratified sand and coarser materials that are beach and other nearshore sediments transported and deposited by wave action.

These are materials that either have settled from suspension in bodies of standing fresh water or have accumulated at their margins through wave action.

Marine - Unconsolidated deposits of clay, silt, sand, or gravel that are well to moderately well sorted and well stratified to moderately stratified (in some places containing shells). They have settled from suspension in salt or brackish water bodies or have accumulated at their margins through shoreline processes such as wave action and longshore drift.

Morainal - Sediment generally consisting of well compacted material that is nonstratified and contains a heterogeneous mixture of particle sizes, often in a mixture of sand, silt, and clay that has been transported beneath, beside, on, within and in front of a glacier and not modified by any intermediate agent.

Saprolite - Rock containing a high proportion of residual silts and clays formed by alteration, chiefly by chemical weathering.

The rock remains in a coherent state, interstitial grain relationships are undisturbed and no downhill movement due to gravity has occurred.

Undifferentiated - A layered sequence of more than three types of genetic material outcropping on a steep erosional escarpment.

Volcanic - Unconsolidated pyroclastic sediments. These include volcanic dust, ash, cinders, and pumice.

Qualifying Descriptors

These have been introduced to qualify the genetic materials and to supply additional information about the mode of formation or depositional environment.

Glacial - Used to qualify nonglacial genetic materials or process modifiers where there is direct evidence that glacier ice exerted a strong but secondary or indirect control upon the mode of origin of the materials or mode of operation of the process. The use of this qualifying descriptor implies that glacier ice was close to the site of the deposition of a material or the site of operation of a process.

Glaciofluvial - Fluvial materials showing clear evidence of having been deposited either directly in front of or in contact with glacier ice.

Glaciolacustrine - Lacustrine materials deposited in contact with glacial ice.

Glaciomarine - Materials of glacial origin laid down in a marine environment, as a result of settling from melting, floating ice and ice shelves.

Organic component

The organic component consists of peat deposits containing >30% organic matter by weight that may be as thin as 10 cm if they overlie bedrock but are otherwise greater than 40 cm and generally greater than 60 cm thick. The classes and their definitions follow.

B	Bog
N	Fen
S	Swamp

Bog - A bog is a peat-covered or peat-filled area, generally with a high water table. Since the surface of the peatland is slightly elevated, bogs are either unaffected or partly affected by nutrient-rich groundwaters from the surrounding mineral soils. The groundwater is generally acidic and low in nutrients (ombrotrophic). The dominant peat materials are sphagnum and forest peat, underlain, at times, by fen peat.

Fen - A fen is a peat-covered or peat-filled area with a high water table, which is usually at the surface. The dominant materials are shallow to deep, well to moderately decomposed fen peat. The waters are mainly rich in nutrients (minerotrophic) and are derived from mineral soils. The peat materials are therefore higher in both nutrients and pH than the peats associated with bogs.

Swamp - A swamp is a peat-covered or peat-filled area. The peat surface is level or slightly concave in cross section. The water table is frequently at or above the peat surface. There is strong water movement from margins or other mineral sources. The microrelief is hummocky, with many pools present. The waters are neutral or slightly acid. The dominant peat materials are shallow to deep mesic to humic forest and fen peat.

C.2 GENETIC MATERIAL MODIFIERS

Material modifiers are used to qualify unconsolidated mineral and organic deposits. Particle-size classes serve to indicate the size, roundness, and sorting of unconsolidated mineral deposits. Fiber classes indicate the degree of decomposition and fiber size of organic materials.

Particle size classes for unconsolidated mineral materials

Blocky: An accumulation of angular particles greater than 256 mm in size.

Bouldery: An accumulation of rounded particles greater than 256 mm in size.

Clayey: An accumulation of particles where the fine earth fraction contains 35% or more clay (<0.002 mm) by weight and particles greater than 2 mm are less than 35% by volume.

Cobbly: An accumulation of rounded particles having a diameter of 64-256 mm.

Gravelly: An accumulation of rounded particles ranging in size from pebbles to boulders.

Loamy: An accumulation of particles of which fine earth fraction contains 35% or less clay (<0.002 mm) by weight and particles greater than 2 mm are less than 35% by volume.

Pebbly: An accumulation of rounded particles having a diameter of 2-64 mm.

Rubbly: An accumulation of angular fragments having a diameter of 2-256 mm.

Sandy: An accumulation of particles of which the fine earth fraction contains more than 70% by weight of fine sand or coarser particles. Particles greater than 2 mm occupy less than 35% by volume.

Silty: An accumulation of particles of which the fine earth fraction contains less than 15% of fine sand or coarser particles and has less than 35% clay. Particles greater than 2 mm occupy less than 35% by volume.

Fiber classes for organic materials

The amount of fiber and its durability are important characterizing features of organic deposits in that they reflect on the degree of decomposition of the material. The prevalence of woody materials in peats is also of prime importance.

Fibric: The least decomposed of all organic materials; there is a large amount of well-preserved fiber that is readily identifiable as to botanical origin. Fibers retain their character upon rubbing.

Mesic: Organic material in an intermediate stage of decompostion; intermediate amounts of fiber are present that can be identified as to their botanical origin.

Humic: Highly decomposed organic material; small amounts of fiber are present that can be identified as to their botanical origin. Fibers can be easily destroyed by rubbing.

Woody: Organic material containing more than 50% of woody fibers.

C.3 SURFACE EXPRESSION

The surface expression of genetic materials is their form (assemblage of slopes) and pattern of forms. Form as applied to unconsolidated deposits refers specifically to the product of the initial mode of origin of the materials. When applied to consolidated materials, form refers to the product of their modification by geological processes. Surface expression also indicates the manner in which unconsolidated genetic materials relate to the underlying unit.

Consolidated and Unconsolidated mineral surface classes

Apron - A relatively gentle slope at the foot of a steeper slope and formed by materials from the steeper, upper slope.

Blanket - A mantle of unconsolidated materials thick enough to mask minor irregularities in the underlying unit but still conforming to the general underlying topography.

Fan - A fan-shaped form similar to the segment of a cone and having a perceptible gradient from the apex to the toe.

Hummocky - A very complex sequence of slopes extending from somewhat rounded depressions or kettles of various sizes to irregular to conical knolls or knobs. There is a general lack of concordance between knolls or depressions. Slopes are generally 9-70% (5-35 degrees).

Inclined - A sloping, unidirectional surface with a generally constant slope not broken by marked irregularities. Slopes are 2-70% (1-35 degrees). The form of inclined slopes is not related to the initial mode of origin of the underlying material.

Level - A flat or very gently sloping, unidirectional surface with a generally constant slope not broken by marked elevations and depressions. Slopes are generally less than 2% (1 degree).

Rolling - A very regular sequence of moderate slopes extending from rounded, sometimes confined concave depressions to broad, rounded convexities producing a wave-lake pattern of moderate relief. Slope length is often 1.6 km or greater and gradients are greater than 5% (3 degrees).

Ridged - A long, narrow elevation of the surface, usually sharp crested with steep sides. The ridges may be parallel, subparallel, or intersecting.

Steep - Erosional slopes, greater than 70% (35 degrees), on both consolidated and unconsolidated materials. The form of a steep erosional slope on unconsolidated materials is not related to the initial mode of origin of the underlying material.

Terraced - Scarp face and the horizontal or gently inclined surface (tread) above it.

Undulating - A very regular sequence of gentle slopes that extends from rounded, sometimes confined concavities to broad rounded convexities producing a wavelike pattern of low local relief. Slope length is generally less than 0.8 km and the dominant gradient of slopes is 2-5% (1-3 degrees).

Veneer - Unconsolidated materials too thin to mask the minor irregularities of the underlying unit surface. A veneer will range from 10 cm to 1 m in thickness and will possess no form typical of the material's genesis.

Organic surface classes

Blanket - A mantle of organic materials that is thick enough to mask minor irregularities in the underlying unit but still conforms to the general underlying topography.

Bowl - A bog or fen occupying concave-shaped depressions.

Domed - A bog with an elevated, convex, central area much higher than the margin. Domes may be abrupt (with or without a frozen core) or gently sloping or have a stepped surface.

Floating - A level organic surface associated with a pond or lake and not anchored to the lake bottom.

Horizontal - A flat peat surface not broken by marked elevations and depressions.

Plateau - A bog with an elevated, flat, central area only slightly higher than the margin.

Ribbed - A pattern of parallel or reticulate low ridges associated with fens.

Sloping - A peat surface with a generally constant slope not broken by marked irregularities.

Veneer - A thin (40 cm-1m) mantle of organic materials which generally conforms to the underlying topography. They may or may not be associated with discontinuous permafrost.

Appendix D

GUIDES FOR EVALUATING SOIL SUITABILITY FOR SELECTED USES

TABLE 8

Land Classification Standards for Irrigation Suitability

Land Characteristics	Subclass	Class 1 - Very Good	Class 2 - Good	Class 3 - Fair	Class 4 - Poor
SOILS	S				
Texture					
very coarse textured very fine textured	v h	Fine sandy loams to clay loams	Loamy fine sand to light clay	Sand to permeable clay	Gravel to clay
Water holding capacity low available moisture capacity	q	40 to 60 sat. % >15cm storage in 1.2m <10cm/hr. hydraulic cond.	35 to 65 sat. % >12.5cm storage in 1.2m <12.5cm/hr. hydraulic cond.	25 to 75 sat. % >7.5cm storage in 1.2m <17.5cm/hr. hydraulic cond.	<25 or >75 sat. % <7.5cm storage in 1.2m >17.5cm/hr. hydraulic cond.
Geological Deposit shallow deposit over sand or gravel	k	.9m or more of fine sandy loam or heavier	.6m or more of fine sandy loam or heavier, or .75m plus of loamy fine sand or sandy loam	.5m or more of sandy loam or heavier, or .6m plus of loamy sand	<.5m of sandy loam or heavier, or .6m of loamy sand or sand
shallow deposit over impervious substrata	b	>3m of permeable material	>2m of permeable material	>1m of permeable material	<1m of permeable material
Salinity and Alkalinity[1,2]	a	<4 ms/cm in 0-.6m <8 ms/cm below .6m <6 S.A.R.	<4 ms/cm in 0-.6m <12 ms/cm below .6m <8 S.A.R.	<8 ms/cm in 0-.6m <15 ms/cm below .6m <12 S.A.R.	>8 ms/cm in 0-.6m >15 ms/cm below .6m >12 S.A.R.
EXTERNAL FEATURES					
Stones - rock clearing	r	None to light clearing	Light to medium clearing	Light to heavy clearing	Excessively stony
Topography Slope excess gradient	T g	<1% and 0.1% in general gradient (0-3% slope)	<3% in general gradient (3-5% slope)	<5% in general gradient (5-10% slope)	>5% in general* gradient (>10% slope)**
DRAINAGE	D				
restricted outlet		No problem anticipated	Moderate drainage problem anticipated but may be improved at relatively low cost	Moderate to severe drainage problem anticipated but may be improved by expensive but feasible measures	Drainage improvement not considered feasible
water table		below 2.4m most of year	could be above 1.5m for a short period, then recedes to 2.4m or lower	within 1.5m most of year	within 1m most of year

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* Criteria for gravity (flood) irrigation requirements.

** Estimated adjustments to slope criteria for overhead or sprinkler type irrigation methods.

[1] If sufficient gypsum is present in the soil, the S.A.R. may be lowered by leaching the soil (a very slow process), and the hydraulic conductivity may then improve.

[2] The degree of salinity may vary widely within short distances, and there may be no clear indication of the area occupied by each salinity class. Unless a very detailed mapping and sampling program is carried out, it is impossible to estimate the acreage occupied by each salinity class.

TABLE 9

Guide for assessing soil suitability as source of topsoil

The term "topsoil" includes soil materials used to cover barren surfaces exposed during construction, and materials used to improve soil conditions on lawns, gardens, flower beds, etc. The factors to be considered include not only the characteristics of the soil itself, but also the ease or difficulty of excavation, and where removal of topsoil is involved, accessibility to the site.

Symbol[1]	Items Affecting Use	Degree of Soil Suitability			
		Good - G	Fair - F	Poor - P	Very Poor - V
u	Moist Consistence[2]	Very friable, friable	Loose, firm	Very firm	Cemented
i	Flooding	None	May flood occasionally for short periods	Frequent flooding	Constantly flooded
w	Wetness[2]	Wetness is not determining if better than very poorly drained.			Very poorly drained and permanently wet soils
t	Slope	0-5%	5-9%	9-15%	>15%
p	Stoniness[2]	Stones 10 m apart (Class 0 and 1)	Stones 2-10 m apart (Class 2)	Stones 0.1-2 m apart (Class 3 and 4)	Stones 0.1 m apart (Class 5)
c	Coarse fragments[2]: percent, by volume	<3%	3-15%	15-35%	>35%
s	Texture[2]	FSL, VFSL, L, SiL, SL, SC if 1:1 clay is dominant	CL, SCL, SiCL, SC if 2:1 clay is dominant; c and sic if 1:1 clay is dominant	S, LS, C and SiC if 2:1 clay is dominant. organic soils[3]	Marl, diatomaceous earth
b	Depth of Topsoil[4]	>40 cm	15-40 cm	8-15 cm	<8 cm
n	Salinity of Topsoil[5]	E.C. 0-1	E.C. 1-4	E.C. 4-8	E.C. >8

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[1] The symbols are used to indicate the nature of the limitation.

[2] For an explanation of texture, consistence, stoniness, coarse fragments and soil drainage classes, see the Manual for Describing Soils in the Field (Canada Soil Survey Committee, 1978).

[3] Non-woody organic materials are assessed as good sources for topsoil if mixed with or incorporated into mineral soil.

[4] The remaining soil material (at least 8 cm) must be reclaimable after the uppermost soil is removed.

[5] E.C. = Electrical Conductivity (millisiemens/cm).

TABLE 10

Guide for assessing soil suitability as source of sand and gravel

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The purpose of this table is to provide guidance for assessing the probable supply as well as quality of the sand or gravel for use as road base material and in concrete. The interpretation pertains mainly to the characteristics of the soil substratum to a depth of 150 cm, augmented by observations made in deep cuts as well as geological knowledge where available.

Symbol[1]	**Items Affecting Use**	**Degree of Soil Suitability**			
		Good - G	**Fair - F**	**Poor - P**	**Very Poor - V**
a	**Unified Soil Group**	SW SP GW GP	SW-SM SP-SM GP-GM GW-GM	SM SW-SC SP-SC GM GP-GC GW-GC	**All other groups and bedrock**
h	**Depth to Seasonal Water Table**	**Not class determining if deeper than 50 cm**		**50 cm**	
q	**Depth to Sand and Gravel**	**<25 cm**	**25-75 cm**[2]	**>75 cm**[2]	
p	**Stoniness**[3]	**Not class determining if stones >.5 m apart (Class 0, 1, 2 and 3)**		**Stones 0.1-0.5 m apart (Class 4)**	**Stones <0.1 m apart (Class 5)**
d	**Depth to Bedrock**	**>100 cm**	**50-100 cm**	**<50 cm**	

[1] **The symbols are used to indicate the nature of the limitation.**

[2] **Rated good if it is known that the underlying gravel or sand deposit is thick (>100 cm).**

[3] **For an explanation of stoniness and rockiness, see the Manual for Describing Soils in the Field (Canada Soil Survey Committee, 1978).**

TABLE 11

Guide for assessing soil suitability as source of roadfill

Fill material for buildings or roads are included in this use. The performance of the material when removed from its original location and placed under load at the building site or road bed are to be considered. Since surface materials are generally removed during road or building construction their properties are disregarded. Aside from this layer, the whole soil to a depth of 150-200 cm should be evaluated. Soil materials which are suitable for fill can be considered equally suited for road subgrade construction.

Symbol[1]	Items Affecting Use[2]	Degree of Soil Suitability			
		Good - G	Fair - F	Poor - P	Very Poor - V
a	Subgrade[3]				
	a. AASHO group index[4]	0-4	5-8	>8	
	b. Unified soil classes	GW, GP[5], SW, SP, SM, GC[5] and SC[5]	CL (with P.I.[6] <15) and ML	CL (with P.I.[6] of 15 or more), CH and MH[7]	OL, OH and Pt
l	Shrink-swell potential	Low	Moderate	High	
f	Susceptibility to frost action[8]	Low	Moderate	High	
t	Slope	0-15%	15-30%	30-45%	>45%
p	Stoniness[9]	Stones >2 m apart (Class 0, 1 and 2)	Stones 0.5-2 m apart (Class 3)	Stones 0.1-0.5 m apart (Class 4)	Stones <0.1 m apart (Class 5)
r	Rockiness[9]	Rock exposures >35 m apart and cover <10% of the surface	Rock exposure 10-35 m apart and cover 10-25% of the surface	Rock exposure 3.5-10 m apart and cover 25-50% of the surface	Rock exposures <3.5 m apart and cover 50-90% of the surface
w	Wetness[9]	Excessively drained to moderately well drained	Imperfectly drained	Poorly drained	Very poorly drained or permanently wet soils
d	Depth to Bedrock	>100 cm	50-100 cm	20-50 cm	<20 cm
h	Depth to Seasonal Water Table	>150 cm	75-150 cm	50-75 cm	<50 cm

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[1] The symbols are used to indicate the nature of the limitation.

[2] The first three items pertain to soil after it is placed in a fill; the last six items pertain to soil in its natural condition before excavation for road fill.

[3] This item estimates the strength of the soil material, that is, its ability to withstand applied loads.

[4] Use AASHO group index only where laboratory data are available for the kind of soil being rated; otherwise, use Unified soil groups.

[5] Downgrade suitability rating to fair if content of fines is more than about 30 percent.

[6] P.I. means plasticity index.

[7] Upgrade suitability rating to fair if MH is largely kaolinitic, friable, and free of mica.

[8] Use this item only where frost penetrates below the paved or hardened surface layer and where moisture transportable by capillary movement is sufficient to form ice lenses at the freezing front.

[9] For an explanation of stoniness, rockiness and soil drainage classes, see the Manual for Describing Soils in the Field (Canada Soil Survey Committee, 1978).

TABLE 12

Guide for assessing soil suitability for permanent buildings

This guide applies to undisturbed soils to be evaluated for single-family dwellings and other structures with similar foundation requirements. The emphasis for rating soils for buildings is on foundation requirements; but soil slope, susceptibility to flooding and other hydrologic conditions, such as wetness, that have effects beyond those related exclusively to foundations are considered too. Also considered are soil properties, particularly depth to bedrock, which influence excavation and construction costs for the building itself and for the installation of utility lines. Excluded are limitations for soil corosivity, landscaping and septic tank absorption fields.

Symbol[2]	Items Affecting Use	Degree of Soil Suitability[3]			
		Good - G	Fair - F	Poor - P	Very Poor - V
w	Wetness[4]	With Basements: Very rapidly, rapidly and well drained. Without Basements: Very rapidly, rapidly, well and moderately well drained.	With Basements: Moderately well drained. Without Basements: Imperfectly drained.	With Basements: Imperfectly, poorly, and very poorly drained. Without Basements: Poorly and very poorly drained.	With Basements: Permanently wet soils. Without Basements: Permanently wet soils.
h	Depth to Seasonal Water Table	With Basements: >150 cm Without Basements: >75 cm	With Basements: 75-150 cm Without Basements: 50-75 cm	With Basements: 25-75 cm Without Basements: 25-50 cm	With Basements: <25 cm Without Basements: <25 cm
i	Flooding	None	None	Occasional flooding (once in 5 years)	Frequent flooding (every year)
t	Slope[5]	0-9%	9-15%	15-30%	>30%
s	Subgrade[6]				
	a. AASHO group index[7]	0-4	5-8	>8	
	b. Unified soil classes	GW, GP, SW, SP, SM and GC and SC	CL (with P.I.[8] <15) and ML	CL (with P.I.[8] of 15 or more), CH and MH	OH, OL and Pt
f	Potential Frost Action[9]	Low (F1, F2)	Moderate (F3)	High (F4)	
p	Stoniness[4]	Stones >10 m apart (Class 0 to 1)	Stones 2-10 m apart (Class 2[10])	Stones 0.1-2 m apart (Class 3[10] to 4)	Stones <0.1 m apart (Class 5[10])
r	Rockiness[4],[11]	Rock exposures >100 m apart and cover <2% of the surface	Rock exposures 30-100 m apart and cover 2-10% of the surface	Rock exposures <30 m apart and cover >10% of the surface	Rock exposures too frequent to allow location of permanent buildings
d	Depth to Bedrock[11]	With Basements: >150 cm Without Basements: >100 cm	With Basements: 100-150 cm Without Basements: 50-100 cm	With Basements: 50-100 cm Without Basements: <50 cm	With Basements: <50 cm

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[1] By halving the slope limits, this table can be used for evaluating soil suitability for buildings with large floor areas, but with foundation requirements not exceeding those of ordinary three-storey dwellings.

[2] The symbols are used to indicate the nature of the limitation.

[3] Some soils assessed as fair or poor may be good sites from an aesthetic or use standpoint, but they will require more site preparation and/or maintenance.

[4] For an explanation of rockiness, stoniness and soil drainage classes, see the Manual for Describing Soils in the Field (Canada Soil Survey Committee, 1978).

[5] Reduce the slope limits by one half for those soils subject to hillside slippage.

[6] This item estimates the strength of the soil, that is, its ability to withstand applied loads. When available, AASHO Group Index values from laboratory tests were used; otherwise the estimated Unified classes were used.

[7] Group index values were estimated from information published by the Portland Cement Association (PCA, 1962), pp. 23-25.

[8] P.I. means plasticity index.

[9] Frost heave only applies where frost penetrates to the assumed depth of the footings and the soil is moist. The potential frost action classes are taken from the United States Army Corps of Engineers (1962), pp. 5-8.

[10] Rate one class better for buildings without basements.

[11] Rate one class better if the bedrock is soft enough so that it can be dug with light power equipment such as backhoes.

TABLE 13

Guide for assessing soil suitability for local roads and streets

This guide applies to soils to be evaluated for construction and maintenance of local roads and streets. These are improved roads and streets having some kind of all-weather surfacing, commonly asphalt or concrete, and are expected to carry automobile traffic all year. They consist of: (1) the underlying local soil material (either cut or fill) called the subgrade; (2) the base material of gravel, crushed rock, or lime or soil cement stabilized soil called the subbase; and (3) the actual road surface or pavement, either flexible or rigid. They also are graded to shed water and have ordinary provisions for drainage. With the probable exception of the hardened surface layer, the roads and streets are built mainly from the soil at hand, and cuts and fills are limited, usually less than 2 meters. Excluded from consideration in this guide are highways designed for fast-moving, heavy trucks.

Properties that affect design and construction of roads and streets are: (1) those that affect the load supporting capacity and stability of the subgrade, and (2) those that affect the workability and amount of cut and fill. The AASHO and Unified Classification give an indication of the traffic supporting capacity. Wetness and flooding affect stability. Slope, depth of hardrock, stoniness, rockiness, and wetness affect the ease of excavation and the amount of cut and fill to reach an even grade.

Symbol[2]	Items Affecting Use	Degree of Soil Suitability			
		Good - G	Fair - F	Poor - P	Very Poor - V
w	Wetness[3]	Very rapidly, rapidly, well and moderately well drained	Imperfectly drained	Poorly and very poorly drained	Permanently wet soils
i	Flooding	None	Infrequent (once in 5 years)	Occasional (once in 2-4 years)	Frequent (every year)
t	Slope	0-9%	9-15%	15-30%	>30%
d	Depth to Bedrock[4]	>100 cm	50-100 cm	<50 cm	
a	Subgrade[5]				
	a. AASHO group index[6]	0-4	5-8	>8	
	b. Unified soil classes	GW, GP, SW, SP, SM, GC[7] and SC[7]	CL (with P.I.[8] <15) and ML	CL (with P.I.[8] of 15 or more), CH and MH	OH, OL and Pt
f	Susceptibility to Frost Heave[9]	Low (F1, F2)	Moderate (F3)	High (F4)	
p	Stoniness[3]	Stones >2 m apart (Class 0 to 2)	Stones 0.5-2 m apart (Class 3)	Stones 0.1-0.5 m apart (Class 4)	Stones <0.1 m apart (Class 5)
r	Rockiness[3]	Rock exposures >100 m apart and cover <2% of the surface	Rock exposures 30-100 m apart and cover 2-10% of the surface	Rock exposures <30 m apart and cover >10% of the surface	Rock exposures too frequent to permit location of roads and streets

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[1] These guidelines, with some adjustment of slope and rockiness limits, will also be useful for assessing soils for use as parking lots.

[2] Symbols are used to indicate the nature of the limitation.

[3] For an explanation of stoniness, rockiness and soil drainage classes, see the Canada Soil Information System (Canada Soil Survey Committee, 1978).

[4] Rate one class better if the bedrock is soft enough so that it can be dug with light power equipment and is rippable by machinery.

[5] This item estimates the strength of soil materials as it applies to roadbeds. When available, AASHO Group Index values from laboratory tests were used; otherwise, the estimated Unified classes were used. The limitations were estimated assuming that the roads would be surfaced. On unsurfaced roads, rapidly drained, very sandy, poorly graded soils may cause washboard or rough roads.

[6] Group index values were estimated from information published by the Portland Cement Association (PCA, 1962) pp. 23-25.

[7] Downgrade to moderate if content of fines (less than 200 mesh) is greater than about 30 percent.

[8] P.I. means plasticity index.

[9] Frost heave is important where frost penetrates below the paved or hardened surface layer and moisture transportable by capillary movement is sufficient to form ice lenses at the freezing point. The susceptibility classes are taken from the United States Army Corps of Engineers (1962) pp. 5-8.

TABLE 14

Guide for assessing soil suitability for trench type sanitary landfills

The trench-type sanitary landfill is a sanitary landfill, in which dry garbage and trash is buried daily in an open trench and covered with a layer of soil material. Suitability of the site is dependent upon the potential for pollution of water sources through groundwater contact with the refuse, or leachate arising from the site. Those properties affecting ease of excavation of the site must be supplemented with geological and hydrological knowledge to provide subsurface soil and groundwater data to a depth of at least 3 to 4.5 m, a common depth of landfills.

Symbol[2]	Items Affecting Use	Degree of Soil Suitability			
		Good - G[3]	Fair - F	Poor - P	Very Poor - V
h	Depth to Seasonal High Water Table	Not class determining if more than 180 cm		100-180 cm	<100 cm
w	Wetness[4]	Not class determining if better than imperfectly drained		Imperfectly drained	Poorly and very poorly drained or permanently wet soils
i	Flooding	None	Rare	Occasional	Frequent
k	Permeability[5]	<5 cm/hr	<5 cm/hr	5-15 cm/hr	>15 cm/hr
t	Slope	0-15%	15-30%	30-45%	>45%
s	Soil Texture[4],[6] (dominant to a depth of 150 cm)	SL, L, SiL, SCL	SiCL[7], CL, SC, LS	SiC, C	Muck, peat, gravel, sand
d	Depth to Hard Bedrock Rippable	>150 cm >150 cm	>150 cm 100-150 cm	100-150 cm 100-150 cm	<100 cm <100 cm
p	Stoniness[4]	Stones >10 m apart (Class 0 and 1)	Stones 2-10 m apart (Class 2)	Stones 0.1-2 m apart (Class 3 and 4)	Stones <0.1 m apart (Class 5)
r	Nature of Bedrock	Impermeable			Highly permeable, fractured, easily soluble

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[1] Based on soil depth (120 cm) commonly investigated in making soil surveys.

[2] The symbols are used to indicate the nature of the limitation.

[3] If probability is high that the soil material to a depth of 3 to 4.5 m will not alter a rating of good or fair, indicate this by an appropriate footnote, such as "Probably good to a depth of 3.5 m", or "Probably fair to a depth of 3.5 m".

[4] For an explanation of stoniness, texture and soil drainage classes, see the Manual for Describing Soils in the Field (Canada Soil Survey Committee, 1978).

[5] Reflects ability of soil to retard movement of leachate from the landfills; may not reflect a limitation in arid and semiarid areas.

[6] Reflects ease of digging and moving (workability) and trafficability in the immediate area of the trench where there may not be surfaced roads.

[7] Soils high in expansive clays may need to be given a suitability rating of poor.

TABLE 15

Guide for assessing soil suitability for area-type sanitary landfills

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In the area-type sanitary landfill refuse is placed on the surface of the soil in successive layers. The daily and final cover material generally must be imported. A final cover of soil material at least 60 cm thick is placed over the fill when it is completed.

The soil under the proposed site should be investigated so as to determine the probability that leachates from the landfill can penetrate the soil and thereby pollute water supplies.

Symbol[1]	Items Affecting Use	Degree of Soil Suitability			
		Good - G	Fair - F	Poor - P	Very Poor - V
h	Depth to Seasonal Water Table[2]	>150 cm	150-100 cm	50-100 cm	<50 cm
w	Wetness[2],[3]	Rapid to moderately well drained	Imperfectly drained	Poorly drained	Very poorly drained or permanently wet soils
i	Flooding	None	Rare	Occasional	Frequent
k	Permeability[4],[5]	Not class determining if less than 5 cm/hr		5-15 cm/hr	>15 cm/hr
t	Slope	0-9%	9-15%	15-30%	>30%

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[1] The symbols are used to indicate the nature of the limitation.

[2] Reflects influence of wetness on operation of equipment.

[3] For an explanation of drainage, see the Manual for Describing Soils in the Field (Canada Soil Survey Committee, 1978).

[4] Reflects ability of the soil to retard movement of leachate from landfills; may not reflect a limitation in arid and semiarid areas.

[5] Due to possible groundwater contamination, impermeable bedrock is considered poor and permeable bedrock is rated very poor for area-type sanitary landfills.

TABLE 16

Guide for assessing soil suitability as cover material for area-type sanitary landfills

The term cover material includes soil materials used to put a daily and final covering layer on refuse in area-type sanitary landfills. This cover material may be derived from the area of the landfill or may be brought in from surrounding areas.

Symbol[1]	Items Affecting Use	Degree of Soil Suitability			
		Good - G	Fair - F	Poor - P	Very Poor - V
u	Moist Consistence[2]	Very friable, friable	Loose, firm	Very firm	Cemented
s	Texture[2],[3]	SL, L, SiL, SCL	SiCL, CL, SC, LS	SiC, C	Muck, peat, sand, gravel
d	Depth to bedrock[4]	>150 cm	100-150 cm	50-100 cm	<50 cm
c	Coarse fragments[2]	<15%	15-35%	>35%	
p	Stoniness[2]	Stones >10 m apart (Class 0 and 1)	Stones 2-10 m apart (Class 2)	Stones 0.1-2 m apart (Class 3 and 4)	Stones < 0.1 m apart (Class 5)
t	Slope	<9%	9-15%	15-30%	>30%
w	Wetness[2]	Not class determining if better than poorly drained		Poorly drained	Very poorly drained or permanently wet soils

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[1] The symbols are used to indicate the nature of the limitation.

[2] For an explanation of consistence, texture, coarse fragments, stoniness and soil drainage classes, see the Manual for Describing Soils in the Field (Canada Soil Survey Committee, 1978).

[3] Soils having a high proportion of non-expansive clays may be given a suitability rating one class better than is shown for them in this table.

[4] Thickness of material excluding topsoil, which will be stockpiled (see guide for topsoil).

TABLE 17

Guide for assessing soil suitability for reservoirs and sewage lagoons

Factors affecting the ability of undisturbed soils to impound water or sewage and prevent seepage are considered for evaluating soils on their suitability for reservoir and lagoon areas. This evaluation considers soil both as a vessel for the impounded area and as material for the enclosing embankment. As the impounded liquids could be potential sources of contamination of nearby water supplies, e.g. sewage lagoons, the landscape position of the reservoir as it affects risk of flooding must also be considered.

Symbol[1]	Items Affecting Use	Degree of Soil Suitability			
		Good - G	Fair - F	Poor - P	Very Poor - V
h	Depth to Water Table[2]	>150 cm	100-150 cm	50-100 cm	<50 cm
i	Flooding[3]	None	None	Subject to infrequent flooding (once in 50 years)	Subject to frequent high level flooding
k	Soil Permeability	0-0.5 cm/hr	0.5-5 cm/hr	5-15 cm/hr	>15 cm/hr
t	Slope	0-2%	2-5%	5-9%	>9%
o	Organic Matter	<2%	2-10%	10-30%	>30%
c	Coarse Fragments[4] <25 cm in diameter, % by volume	<20%	20-35%	>35%	
p	Stoniness[4], >25 cm diameter, percent of surface area	<3% (Class 0, 1 and 2)	3-15% (Class 3)	15-50% (Class 4)	>50% (Class 5)
d	Depth to Bedrock[5]	>150 cm	100-150 cm	50-100 cm	<50 cm
j	Thickness of Slowly Permeable Layer	>100 cm	50-100 cm	50-25 cm	<25 cm
a	Subgrade Unified Soil Classes	GC, SC, CL, & CH	GM, ML, SM & MH	SW & SP	OL, OH & Pt GP, GW

[1] The symbols are used to indicate the nature of the limitation.

[2] If the floor of the lagoon has nearly impermeable material at least 50 cm thick, disregard depth to water table.

[3] Disregard flooding if it is not likely to enter or damage the lagoon (flood waters have low velocity and depth less than 150 cm).

[4] For an explanation of coarse fragments and stoniness classes, see the Manual for Describing Soils in the Field (Canada Soil Survey Committee, 1978).

[5] Surface exposures of non rippable rock are rated very poor. If underlying bedrock is impermeable, rating should be one class better.

TABLE 18

Guide for assessing soil suitability for septic tank absorption fields

This guide applies to soils to be used as an absorption and filtering medium for effluent from septic tank systems. A subsurface tile system laid in such a way that effluent from the septic tank is distributed reasonably uniformly into the natural soil is assumed when applying this guide. A rating of poor need not mean that a septic system should not be installed in the given soil, but rather, may suggest the difficulty, in terms of installation and maintenance, which can be expected.

Symbol[1]	Items Affecting Use	Degree of Soil Suitability			
		Good - G	Fair - F	Poor - P	Very Poor - V
k	Permeability[2]	Rapid to moderately rapid	Moderate	Slow	Very slow
	Percolation Rate[3] (Auger hole method)	About 8-18 min/cm[3]	18-24 min/cm	Slower than 24 min/cm	
h	Depth to Seasonal Water Table[4]	>150 cm[5]	100-150 cm	50-100 cm	<50 cm
i	Flooding	Not subject to flooding	Not subject to flooding	Subject to occasional flooding (once in 5 years)	Floods every year
t	Slope	0-9%	9-15%	15-30%	>30%
d	Depth to Hard Rock, bedrock or other impervious materials	>150 cm	100-150 cm[6]	50-100 cm	<50 cm

[1] The symbols are used to indicate the nature of the limitation.

[2] The suitability ratings should be related to the permeability of soil layers at and below depth of the tile line.

[3] Soils having a percolation rate less than about 8 min/cm are likely to present a pollution hazard to adjacent waters. This hazard must be noted, but the degree of hazard must, in each case, be assessed by examining the proximity of the proposed installation to water bodies, water table, and related features. The symbol g is used to indicate this condition. Refer to U.S. Dept. of Health, Education and Welfare (1969) for details of this procedure.

[4] Seasonal means for more than one month. It may, with caution, be possible to make some adjustment for the severity of a water table limitation in those cases where seasonal use of the facility does not coincide with the period of high water table.

[5] A seasonal water table should be at least 100 cm below the bottom of the trench at all times for soils rated Good (U.S. Dept. of Health, Education and Welfare, 1969). The depths used to water table are based on an assumed tile depth of 50 cm. Where relief permits, the effective depth above a water table or rock can be increased by adding appropriate amounts of fill.

[6] Where the slope is greater than 9%, a depth to bedrock of 100-150 cm is assessed as poor.

TABLE 19

Guide for assessing soil suitability for playgrounds

This guide applies to soils to be used intensively for playgrounds for baseball, football, badminton, and for other similar organized games. These areas are subject to intensive foot traffic. A nearly level surface, good drainage, and a soil texture and consistence that gives a firm surface generally are required. The most desirable soils are free of rock outcrops and coarse fragments.

Soil suitability for growing and maintaining vegetation is not a part of this guide, except as influenced by moisture, but is an important item to consider in the final evaluation of site.

Symbol[1]	Items Affecting Use	Degree of Soil Suitability			
		Good - G	Fair - F	Poor - P	Very Poor - V
w	Wetness[2]	Rapidly, well and moderately well drained soils with no ponding or seepage. Water table below 75 cm during season of use.	Moderately well drained soils subject to occasional seepage or ponding of short duration and imperfectly drained soils. Water table below 50 cm during season of use.	Imperfectly drained soils subject to seepage or ponding, and poorly drained soils. Water table above 50 cm during season of use.	Very poorly drained and permanently wet soils.
i	Flooding	None during season of use.	Occasional flooding. May flood once every 2-3 years during season of use.	Floods every year during season of use.	Prolonged flooding during season of use.
k	Permeability	Very rapid to moderate.	Moderately slow and slow.	Very slow.	
t	Slope	0-2%	2-5%	5-9%	>9%
d	Depth to Bedrock	>100 cm	50-100 cm[3]	<50 cm[3]	
c	Coarse fragments on surface[2]	Relatively free of coarse fragments.	<20% coarse fragments.	>20% coarse fragments.	
p	Stoniness[2]	Stones >10 m apart. (Class 0 to 1)	Stones 2-10 m apart. (Class 2)	Stones 0.1-2 m apart. (Class 3, 4)	Stones <0.1 m apart. (Class 5)
r	Rockiness[2]	Rock exposures >100 m apart and cover <2% of the surface.	Rock exposures 30-100 m apart and cover about 2-10% of the surface.	Rock exposures <30 m apart and cover >10% of the surface.	Rock outcrops too frequent to permit playground location.
s	Surface Soil Texture[2],[4]	SL, FSL, VFSL, L	SiL, CL, SCL, SiCL, LS	SC, SiC, C[5]; S, Si	Peaty soils; S and LS subject to blowing.
q	Depth to Sand or Gravel[6]	>100 cm	50-100 cm	<50 cm	
m	Useful Moisture[7]	Water storage capacity[8] >15.0 cm and/or adequate rainfall and/or low evapotranspiration.	Water storage capacity[8] 7.5-15 cm and/or moderate rainfall and/or moderate evapotranspiration.	Water storage capacity[8] <7.5 cm and/or low rainfall and/or high evapotranspiration.	

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[1] The symbols are used to indicate the nature of the limitation.

[2] See also definitions for coarse fragments, rockiness, stoniness, textural and soil drainage classes in the Manual for Describing Soils in the Field (Canada Soil Survey Committee, 1978). Coarse fragments for the purpose of this table include gravels and cobbles.

[3] Downgrade to a very poor suitability rating if the slope is greater than 5%.

[4] Surface soil texture influences soil ratings as it affects foot trafficability, surface wetness, dust, and maintenance. Adverse soil textures may be partially or completely overcome with the addition of topsoil.

[5] Moderately well and well drained SC, SiC and C soils may be rated fair.

[6] Depth to sand or gravel is considered a limitation in that levelling operations may expose sand or gravel, thereby bringing about adverse surface textures and undesirable amounts of coarse fragments. The addition of topsoil after the levelling process would overcome this limitation.

[7] This item attempts to evaluate the adequacy of moisture for vegetative growth. It incorporates the concept of supply through rainfall, loss through evapotranspiration, and storage within the rooting zone. In soils where the water table is within rooting depth for a significant portion of the year, water storage capacity may not significantly influence vegetation growth.

[8] Consult glossary for definitions of terms used.

TABLE 20

Guide for assessing soil suitability for picnic areas

This guide applies to soils considered for intensive use as park-type picnic areas. It is assumed that most vehicular traffic will be confined to the access roads. Soil suitability for growing and maintaining vegetation is not a part of this guide, except as influenced by moisture, but is an important item to consider in the final evaluation of site.

Symbol[1]	Items Affecting Use	Degree of Soil Suitability			
		Good - G	Fair - F	Poor - P	Very Poor - V
w	Wetness[2]	Very rapidly, rapidly, well and moderately well drained soils not subject to seepage or ponding. Water table below 50 cm during season of use.	Moderately well drained soils subject to occasional seepage or ponding and imperfectly drained soils not subject to ponding or seepage. Water Table above 50 cm for short periods during season of use.	Imperfectly drained soils subject to seepage or ponding. Poorly drained soils. Water table above 50 cm and often near surface for a month or more during season of use.	Very poorly drained and permanently wet soils.
i	Flooding	None during season of use.	May flood 1 or 2 times per year for short periods during season of use.	Floods more than 2 times during season of use.	Prolonged flooding during season of use.
t	Slope	0-9%	9-15%	15-30%	>30%
s	Surface Soil Texture[2],[3]	SL, FSL, VFSL, L	SiL, CL, SCL, SiCL, LS, and sand other than loose sand.	SC, SiC, C[4]; Si	Peaty soils; loose sand subject to blowing.
c	Coarse Fragments on Surface[2]	0-20%	20-50%	>50%	
p	Stoniness[2]	Stones >2 m apart (Class 0 to 2)	Stones 1-2 m apart (Class 3)	Stones 0.1-1 m apart (Class 4)	Stones <0.1 m apart (Class 5)
r	Rockiness[2],[5],[6]	Rock exposures roughly 30-100 or more m apart and cover <10% of the surface.	Rock exposures roughly 10-30 m apart and cover 10-25% of the surface.	Rock exposures <10 m apart and cover >25% of the surface.	Rock exposures too frequent to permit location of picnic areas.
m	Useful Moisture[7]	Water storage capacity[8] >15 cm and/or adequate rainfall and/or low evapotranspiration.	Water storage capacity[8] 7.5-15 cm and/or moderate rainfall and/or moderate evapotranspiration.	Water storage capacity[8] <7.5 cm and/or low rainfall and/or high evapotranspiration.	

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[1] The symbols are used to indicate the nature of the limitation.

[2] See also definitions for coarse fragments, rockiness, stoniness, textural and soil drainage classes in the Manual for Describing Soils in the Field (Canada Soil Survey Committee, 1978). Coarse fragments for the purpose of this table, include gravels and cobbles. Some gravelly soils may be rated as having a slight limitation if the content of gravel exceeds 20% by only a small margin providing (a) the gravel is embedded in the soil matrix, or (b) the fragments are less than 2 cm in size.

[3] Surface soil texture influences soil ratings as it affects foot trafficability, dust and soil permeability.

[4] Moderately well and well drained SC, SiC and C soils may be rated fair.

[5] Very shallow soils are rated as having severe or very severe limitations for stoniness or rockiness.

[6] The nature and topography of the bedrock exposures may significantly alter these ratings. As such, on-site investigations will be necessary in map units containing bedrock when these are considered as possible sites.

[7] This item attempts to evaluate the adequacy of moisture for vegetative growth. It incorporates the concept of supply through rainfall, loss through evapotranspiration, and storage within the rooting zone. In soils where the water table is within rooting depth for a significant portion of the year, water storage capacity may not significantly influence vegetation growth.

[8] Consult glossary for definitions of terms used.

TABLE 21

Guide for assessing soil suitability for camp areas

This guide applies to soils to be used intensively for tents and camp trailers and the accompanying activities of outdoor living. It is assumed that little site preparation will be done other than shaping and levelling for campsites and parking areas. The soil should be suitable for heavy foot traffic by humans and limited vehicular traffic. Soil suitability for growing and maintaining vegetation is not a part of this guide, but is an important item to consider in the final evaluation of site.

Back country campsites differ in design, setting and management but require similar soil attributes. These guides should apply to evaluations for back country campsites but depending on the nature of the facility the interpreter may wish to adjust the criteria defining a given degree of limitation to reflect the changed requirement. For example, small tentsites may allow rock exposures greater than 10 m apart to be considered a slight limitation.

Symbol[1]	Items Affecting Use	Degree of Soil Suitability			
		Good - G	Fair - F	Poor - P	Very Poor - V
w	Wetness[2]	Very rapidly, rapidly, well and moderately well drained soils with no seepage or ponding. Water table below 75 cm during season of use.	Moderately well drained soils subject to occasional seepage or ponding and imperfectly drained soils with no seepage or ponding. Water table below 50 cm during season of use.	Imperfectly drained soils subject to seepage or ponding and poorly drained soils. Water table above 50 cm during season of use.	Very poorly drained and permanently wet soils.
i	Flooding	None	Very occasional flooding during season of use. Once in 5-10 years.	Occasional flooding during season of use. Once in 2-4 years.	Flooding during every season of use.
k	Permeability	Very rapid to moderate inclusive.	Moderately slow and slow.	Very slow.	
t	Slope	0-9%	9-15%	15-30%	>30%
s	Surface Soil Texture[2,3]	SL, FSL, VFSL, L	SiL, SCL, CL, SiCL, LS, and sand other than loose sand.	SC, SiC, C[4]; Si	Peaty soils; loose sand subject to blowing.
c	Coarse Fragments on Surface[2,5]	0-20%	20-50%	>50%	
p	Stoniness[2,6]	Stones >10 m apart (Class 0 and 1)	Stones 2-10 m apart (Class 2)	Stones 0.1-2 m apart (Class 3 and 4)	Stones < 0.1 m apart (Class 5)
r	Rockiness[2,6]	No rock exposures	Rock exposures >10 m apart and cover <25% of the area.	Rock exposures <10 m apart and cover >25% of the area.	Rock exposures too frequent to permit campground location.

[1] The symbols are used to indicate the nature of the limitation.

[2] See also definitions for coarse fragments, rockiness, stoniness, textural and soil drainage classes in the Manual for Describing Soils in the Field (Canada Soil Survey Committee, 1978).

[3] Surface soil texture influences soil ratings as it affects foot trafficability, dust, and soil permeability.

[4] Moderately well and well drained SC, SiC and C soils may be rated fair.

[5] Coarse fragments for the purpose of this table include gravels and cobbles. Some gravelly soils may be rated as having slight limitations if the content of gravel exceeds 20% by only a small margin, providing (a) the gravel is embedded in the soil matrix, or (b) the fragments are less than 2 cm in size.

[6] Very shallow soils are rated as having a limitation for rockiness and/or stoniness.

TABLE 22

Guide for assessing soil suitability for paths and trails

It is assumed that the trails will be built at least 45 cm wide and that obstructions such as cobbles and stones will be removed during construction. It is also assumed that a dry, stable tread is desirable and that muddy, dusty, worn or eroded trail treads are undesirable. Hiking and riding trails are not treated separately, but as the design requirements for riding trails are more stringent, a given limitation will be more difficult to overcome. Poor or very poor suitability does not indicate that a trail cannot or should not be built. It does, however, suggest higher design requirements and maintenance to overcome the limitations.

Symbol[1]	Items[2] Affecting Use	Degree of Soil Suitability			
		Good - G	Fair - F	Poor - P	Very Poor - V
s	Texture[3],[4]	SL, FSL, VFSL, LS, L	SiL, CL, SiCL, SCL	SC, SiC, C[5]; Sand, Si	Peaty soils; loose sand subject to blowing
c	Coarse Fragment Content[4],[6]	0-20%	20-50%	>50%	
p	Stoniness[4]	Stones >2 m apart (Class 0 to 2)	Stones 1-2 m apart (Class 3)	Stones 0.1-1 m apart (Class 4)	Stones <0.1 m apart (Class 5)
w	Wetness[4]	Very rapidly, rapidly well, and moderately well drained soils. Water table below 50 cm during season of use.	Moderately well drained soils subject to occasional seepage and ponding and imperfectly drained soils. Water table may be above 50 cm for short periods during season of use.	Poorly and very poorly drained soils. Water table above 50 cm and often near surface for a month or more during season of use.	Permanently wet soils.
r	Rockiness[4],[7]	Rock exposures >30 m apart and cover <10% of the surface.	Rock exposures 10-30 m apart and cover 10-25% of the surface.	Rock exposures <10 m apart and cover >25% of the surface.	Rock exposures too frequent to permit location of paths and trails.
t	Slope[8]	0-15%	15-30%	30-60%	>60%
i	Flooding	Not subject to flooding during season of use.	Floods 1 or 2 times during season of use.	Floods more than 2 times during season of use.	Subject to prolonged flooding during season of use.

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[1] The symbols are used to indicate the nature of the limitation.

[2] The items affecting use listed in this table are those which have been shown to cause significant differences in trail response. Elevation, aspect, position on slope, and snow avalanching may have slight affects or influence trail management and should be considered in the final site evaluation. Items such as vegetation, fauna, and scenic value are not considered in the guidelines (Epp, 1977).

[3] Texture refers to the soil texture which will form the tread texture. This is the surface texture on level areas but may be a subsurface texture on slopes. Textural classes are based on the less than 2 mm soil fraction. Texture influences soil ratings as it influences foot trafficability, dust, design or maintenance of trails, and erosion hazards.

[4] See also definitions for coarse fragments, rockiness, stoniness, textural and soil drainage classes in the Manual for Describing Soils in the Field (Canada Soil Survey Committee, 1978).

[5] Moderately well and well drained SC, SiC and C soils may be rated fair.

[6] Coarse fragments for the purpose of this table, include gravels and cobbles. Gravels tend to cause unstable footing when present in high amounts, and are also associated with increased erosion. Cobbles (and stones) must be removed from the trail tread, increasing construction and maintenance difficulties. Some gravelly soils may be rated as having a slight limitation if the content of gravel exceeds 20% by only a small margin providing (a) the gravel is embedded in the soil matrix or (b) the fragments are less than 2 cm in size.

[7] The type of rock outcrop (flat lying vs cliffs), and the orientation of the structure (linear cliffs vs massive blocks) can greatly alter the degree of the limitation. Each site with a Rockiness limitation based on the percent rock outcrop above should be evaluated on its own merits and the degree of limitation should then be modified appropriately if necessary.

[8] Slope in this context refers to the slope of the ground surface, not the slope of the tread.

Appendix E

CORRELATION OF THE SOIL SERIES DESCRIPTIONS FROM THE SOIL SURVEY OF THE RURAL MUNICIPALITY OF VICTORIA

The detailed and semi-detailed resurvey of the Rural Municipality of Victoria replaces portions of the reconnaissance soil surveys of South-Central Manitoba (1943) and the Carberry Map Sheet Area (1957). This resurvey benefits from more intensive field examination of soils and larger map scale formats which permit the delineation of more soil detail not possible on reconnaissance (1:126,720 scale) soil maps.

The reconnaissance mapping utilized broadly defined soil groupings called "Soil Associations" consisting of related but unlike soils which occur in characteristic landscape patterns on similar parent material. These related soils, called "soil associates" occupy different positions in the landscape and differ in profile because of local influences of topography, drainage and vegetation. Individual soil associates can occupy large continuous land areas, but more commonly occupy small areas and occur in complex patterns with other associates.

Soil associates that have similar profile characteristics but vary in some physical feature important to agricultural use, are classified as phases of associates. Recognition of soil phases is based on such external features as topography, stoniness or the presence of an unconforming subsurface parent material characteristic. These phases are now recognized as phases of soil series or are of significant extent and importance to be classified as separate soil series.

A taxonomic classification unit approximately equivalent to soil associates called "soil series" is used in the resurvey as the basic taxonomic unit and as the map delineation identifier. In general, the allowable range in variation of soil profile characteristics is significantly less than the range permitted in the description of soil associates. A comparison of presently defined soil series with soil associations, soil associates and phases described in the Carberry Map Sheet Area Report No. 7) or the South-Central Manitoba (Report No. 25) Soil Reports is presented in Table 23.

Table 23. Correlation of the Soils of the Rural Municipality of Victoria with Soil Associations from the Reconnaissance Soil Surveys of South-Central Manitoba (1943) and Carberry (1957).

Map Symbol	Soil Name	Subgroup	Soil Association	Soil Association and Associates of the South-Central and Carberry Map Sheets.
AIZ	Arizona	Orthic Regosol	Stockton	Eroded phases of Stockton Association.
ASB	Assiniboine	Gleyed Cumulic Regosol	Assiniboine	Imperfectly drained inclusion of the Assiniboine Complex along the Assiniboine River.
ATN	Altamont	Orthic Dark Gray	Altamont	Altamont, well drained Gray-Black.
BKA	Birkenhead	Calcareous Black	Agassiz	Agassiz, Calcareous Blackearth-like.
BKR	Basker	Rego Humic Gleysol	Levine	Neelin, (Assiniboine Complex) poorly drained on recent alluvium.
BNE	Bone	Gleyed Dark Gray	Firdale	Loamy Degraded Black associates.
CAV	Carvey	Rego Humic Gleysol	Croyon	Agassiz, Blumenstein Complex, Marringhurst or Heaslip Complex, Meadow on fine loams over coarse sands and gravel.
CCS	Cactus	Rego Black	Stockton	Blackearth associates.
CKD	Crookdale	Gleyed Rego Black	Glenboro	Imperfectly drained minor associate of the dominantly well-drained Glenboro Association.
CXF	Carroll	Rego Black	Carrol	Well drained dominate associate.
CXT	Capell	Gleyed Rego Black	Croyon	Agassiz, loam overlay, Blumenstein Complex, Marringhurst, loam overlay; Heaslip Complex, fine loams over coarse sand and gravel; intermediately drained Meadow-Blackearth associate.
CXV	Charman	Gleyed Black	Holland	Imperfectly drained Black-Meadow associates.
CYN	Croyon	Orthic Black	Croyon	Agassiz, Blumenstein Complex, Marringhurst, and Heaslip Complex, Blackearth, fine loam over coarse sand and gravel.
DGF	Darlingford	Orthic Black	Darlingford	Darlingford, well drained Blackearth associate.
DLN	Danlin	Gleyed Dark Gray	Carroll, Altamont	Imperfectly drained minor inclusion of the Carroll Association.
DOB	Dobbin	Orthic Black	Dobbin	Firdale-Stockton transition; fine sand to loamy fine sand, well drained Degraded Black associate of the Firdale Association (Carberry Report).
DOT	Dorset	Orthic Black	Marringhurst	Blackearth associates.

Table 23 cont.

Map Symbol	Soil Name	Subgroup	Soil Association	Soil Association and Associates of the South-Central and Carberry Map Sheets.
DRN	Durnan	Rego Black	Holland	Minor Blackearth associates.
DZW	Dezwood	Orthic Dark Gray	Dezwood	Pembina, well drained Gray-Black associate.
ERX	Eroded Slopes Complex	variable		Truncated Chernozemic, Luvisolic and Regosolic soils found on steep sloping, dissected terrain and valley, sidewalls along the Cyress and Assiniboine Rivers.
FFR	Fifere	Orthic Dark Gray	Fifere	*Snowflake* or *Manitou*, *Gray-Black associate* on dominantly shaly till.
FRS	Ferris	Gleyed Rego Black	Darlingford	Darlingford, Meadow-Blackearth associate.
FIR	Firdale	Orthic Dark Gray	Carroll, Altamont	Well drained associate of the Carroll Association.
GBO	Glenboro	Orthic Black	Glenboro	Blackearth associates.
GRO	Grover	Gleyed Rego Black	Glenboro	Minor, imperfectly drained Black-Meadow associate.
GRR	Guerra	Rego Humic Gleysol	Knudson	Altamont, Snowflake, some Manitou; Meadow associate.
GVS	Gervais	Gleyed Cumulic Regosol	La Salle	Riverdale, intermediately drained on recent alluvium.
HAT	Halstead	Orthic Dark Gray	Firdale	Coarse loamy associates of Firdale Association.
MEB	Hebbott	Rego Black	Darlingford	Calcareous Black associates.
HHF	Hochfeld	Orthic Black	Hochfeld	Altona light loam, moderately well drained Blackearth; Almasippi sandy loam, Blackearth.
HIT	Hilton	Orthic Black	Hilton	Well drained, dominant associate of the Hilton Association.
HKS	Hickson	Rego Humic Gleysol	Hilton	Poorly drained associate of the Hilton Association occurring in depressions and adjacent to sloughs.
HMO	Hummerston	Gleyed Rego Black	Stockton	Minor, Black-Meadow associates.
HRG	Harding	Gleyed Black	Harding	Black-Meadow associates.
JAY	Jaymar	Gleyed Rego Black	Heaslip	Heaslip Complex; minor inclusion.
JIK	Janick	Orthic Black	Harding	Blackearth associates.
JYL	Joyale	Gleyed Rego Black	Knudson	Altamont, Snowflake, some Manitou; imperfectly drained Meadow-Blackearth.

Table 23 cont.

Map Symbol	Soil Name	Subgroup	Soil Association	Soil Association and Associates of the South-Central and Carberry Map Sheets.
KIS	Kingsley	Dark Gray Luvisol	Altamont	Altamont, well drained gray associate.
KUD	Knudson	Orthic Black	Knudson	Altamont and Snowflake, Blackearth.
LEI	Levine	Gleyed Cumulic Regosol	Levine	Neelin (Assiniboine Complex) immature soils, intermediately drained on recent alluvium.
LRY	Leary	Orthic Dark Gray	Leary	Leary, Gray Wooded and Gray-Black soils.
LSL	La Salle	Cumulic Regosol	La Salle	Riverdale, immature soils on recent terrace and flood plain.
LSR	Landseer	Rego Humic Gleysol	Oliver	Poorly drained, Meadow associate.
LVH	Lavenham	Gleyed Black	Stockton	Black- Meadow associates.
LWN	Lowton	Rego Humic Gleysol	Harding	Harding; minor associates of Oliver Association.
MDN	Marsden	Rego Humic Gleysol	Heaslip	Heaslip Complex; minor inclusion.
MKY	Mockry	Rego Humic Gleysol	Stockton	Meadow associates.
MHC	Marsh Complex	-	-	Waterlogged, miscellaneous land.
MOW	Mowbray	Cumulic Regosol	Levine	Neelin, Assiniboine Complex, loamy immature soils on moderately well drained terraces.
MRH	Marringhurst	Calcareous Black	Marringhurst	Marringhurst, Blackearth-like.
MXT	Melland	Gleyed Rego Black	Heaslip	Heaslip Complex; minor inclusion.
NKK	Nikkel	Gleyed Black	Darlingford	Darlingford, intermediately drained Blackearth.
NSH	Narish	Rego Humic Gleysol	Altamont	Minor, poorly drained Meadow associates.
NYO	Nayler	Orthic Dark Gray Luvisol	Snowflake	Well drained, Gray-wooded associate of the Snowflake Association developed on non-calcareous shale till. Nayler soils are mapped mostly on shale till ridges which occur as inclusions in Pembina Association map delineations as well as Snowflake Association map delineations.
OBR	Oberon	Gleyed Black	Glenboro	Black-Meadow associate.
OIV	Oliver	Gleyed Black Solonetz	Oliver	The dominant imperfectly drained associate of the Oliver Association.

Table 23 cont.

Map Symbol	Soil Name	Subgroup	Soil Association	Soil Association and Associates of the South-Central and Carberry Map Sheets.
OLK	Ollneck	Gleyed Dark Gray Luvisol	Pembina	Minor, imperfectly drained; inclusions.
ONH	Onahan	Gleyed Regosol	Stockton	Imperfectly drained, minor, duned associates.
PBI	Pembina	Dark Gray Luvisol	Pembina	Pembina, Gray associate.
PDA	Prodan	Gleyed Rego Black	Carroll, Altamont	Imperfectly drained associate of the Carroll Association.
PER	Perillo	Terric Mesisol	Perillo	Organic shallow peat and muck soils.
PPR	Poplar Point	Gleyed Cumulic Regosol	Assiniboine	Assiniboine Complex; lacks surface horizon.
PTR	Petrel	Gleyed Black	Glenboro	Black-Meadow associates.
RAM	Ramada	Orthic Black	Carroll	Inclusions of the well drained Carroll Association.
RMP	Rempel	Calcareous Black	Holland	Minor, Blackearth associate.
SCK	Stockton	Orthic Black	Stockton	Stockton sand and loamy sand, Blackearth-like associate.
SEU	Shellmouth Complex	variable	Eroded Slopes	Associated with rivers and their tributaries.
SEE	Sewell	Rego Humic Gleysol	Stockton	Poorly drained Meadow associate.
SGO	Sigmond	Gleyed Rego Black	Oliver	Minor, imperfectly drained associates.
SHX	Shilox	Orthic Regosol	Stockton	Duned, loose sand associates.
SXP	Sutton	Rego Humic Gleysol	Wellwood	Poorly drained Meadow associates.
TDP	Tadpole	Rego Humic Gleysol	Carroll	Poorly drained associate of the Carroll Association.
TGL	Tiger Hills	Orthic Dark Gray	Hilton	Inclusions of the well drained, Gray-black associate of the Hilton Association occurring chiefly under woods on northern and eastern slopes of morainic hills.
TLI	Tellier	Gleyed Dark Gray	Altamont	Altamont, Snowflake; shallow loam to clay deposits over till, intermediately drained Gray-Black associate.
TOC	Torcan	Gleyed Black	Holland	Imperfectly drained Black-Meadow associates.
ULH	Ullrich	Gleyed Black	Knudson	Altamont-Darlingford transition; loam to clay deposit over till; intermediately drained Blackearth.
VDL	Vandal	Orthic Dark Gray	Vandal	Blumenstein Complex, Leary; sandy loam overlay on sand and gravel; gray Black associate.

Table 23 cont.

Map Symbol	Soil Name	Subgroup	Soil Association	Soil Association and Associates of the South-Central and Carberry Map Sheets.
VDS	Vordas	Rego Humic Gleysol	Holland	Poorly drained, Meadow associates.
VTL	Vartel	Gleyed Dark Gray	Vandal	Blumenstein Complex, Leary; sandy loam to loam overlay over sand and gravel; intermediately drained Gray-Black associate.
WIK	Winkler	Orthic Black	Winkler	Morden, Blackearth associate.
WWB	Willowbend	Rego Humic Gleysol	La Salle	Riverdale, Eroded Slopes Complex, poorly drained (Meadow) soils along channels and flood plain.
WWD	Wellwood	Orthic Black	Glenboro	Well drained Blackearth associate.
XVI	Xavier	Typic Mesisol	Xavier	Organic, peat and muck soils.

Appendix F

MAP SYMBOLOGY AND SOIL MAP LEGEND

F.1 MAP SYMBOLS

Map delineations are labelled with soil or non-soil names which best represent the soil features that occur within the delineation. Each delineation also contains variable proportions of unidentified similar or dissimilar soils. Some of these unidentified soils are limiting for the intended use of the delineation and some are not (eg. poorly drained soils in well drained crop land is limiting while Rego Black soils in a dominantly Orthic Black landscape are not). The limits of soil components differ for simple map units which are composed of delineations labelled with one named soil, and compound map units which are labelled with two or three named soils. The percentile assigned to each component of compound map units represents estimated ratios of the occurrence of named soils within a delineation. For the purpose of describing compound map units, components are considered dominant if they occupy >40% of a map unit, significant from 15-40%, and minor if they occupy <15 %[11]. Minor components are described only if they are highly contrasting.

It is often desirable to indicate by soil map symbol, variations in soil properties or landscape likely to influence soil management. The affect of four such properties or features is indicated in the denominator of the map symbol. These phases are erosion, topography, stoniness and salinity. The effect of two miscellaneous soil features is indicated in the numerator of the map symbol. These features are surface peatiness and improved drainage.

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[11] Agriculture Canada. 1981. A Soil Mapping System for Canada. Land Resource Research Institute. Cont. No. 142. Ottawa, Canada.

Phase Classes[12]

Degree of Erosion

x non-eroded or minimal
1 slightly eroded
2 moderately eroded
3 severely eroded
o overblown

Slope Class

x	0-2%	level to very gently sloping
c	2-5%	gently sloping
d	5-9%	moderately sloping
e	9-15%	strongly sloping
f	15-30%	steeply sloping
g	30-60%	very steeply sloping

Miscellaneous Soil Phases

p surface organic deposits
  (15-40 cm thick)
d improved soil drainage

Stoniness

x non-stony
1 slightly stony
2 moderately stony
3 very stony
4 exceedingly stony
5 excessively stony

Degree of Salinity

x non-saline
s weakly saline
t moderately saline
u strongly saline
u strongly saline

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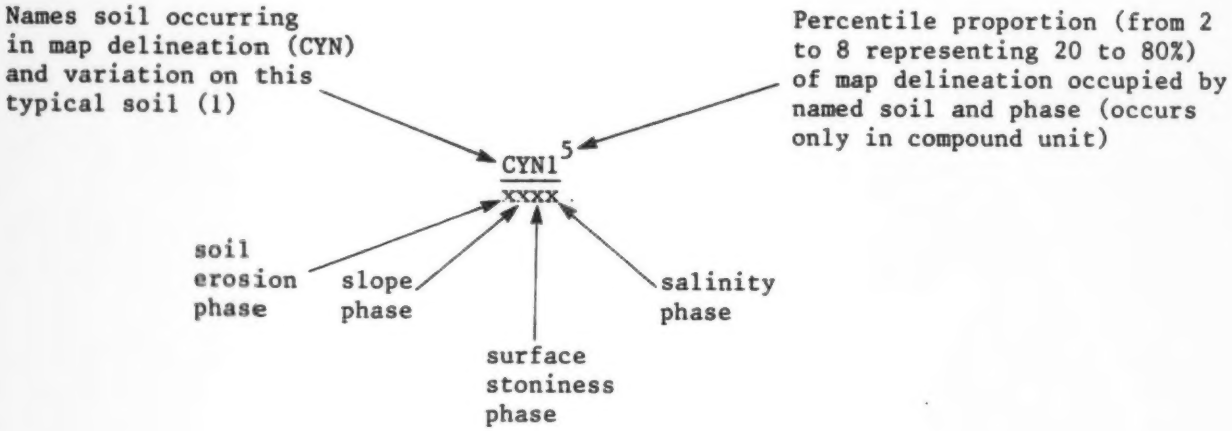
[12] Day, J.H. 1982. The Canada Soil Information System. Manual for describing soils in the field. Research Branch, by Canada, Ottawa

Examples of Map Symbols


Names soil occurring in map delineation (CYN) and variation on this typical soil (1)
Percentile proportion (from 2 to 8 representing 20 to 80%) of map delineation occupied by named soil and phase (occurs only in compound unit)
CYN1 5
xxxx
soil erosion phase
slope phase
surface stoniness phase
salinity phase

Map Units

Simple Map Units (only one soil named)

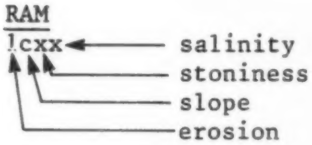
Soil Series

PBI

Soil Series with variation from modal soil

PBI1

Soil Series with phases


RAM
1cxx
salinity
stoniness
slope
erosion

Compound Map Units (more than one named soil, soil variant or phase)

$$\frac{\text{PBI}^{6}}{\text{2e1x}} - \frac{\text{TDPp}^{4}}{\text{xxxs}}$$

Approximately 60% of this example map unit is moderately eroded (2), slightly stony (1), Pembina soils (PBI) occurring on strongly sloping (e) land; and 40% of the map unit is slightly saline (s), Tadpole soil with a thin (15-40 cm) peaty (TDPp) surface layer.

Complex Map Units (undifferentiated complex of soil/landscape features)

ERX ↑ eroded slopes complex

SEU ↑ Shellmouth Complex

Non-Soil Features

ZZ - water bodies (lagoons, ponds, lakes)

Q - quarries (rock, gravel and sand pits)

Soil Legend for R.M. OF VICTORIA November 1988

Soil Symbol	Soil Name	Surface Texture	Soil Drainage	Mode of Deposition	Family Particle Size	Subgroup
AIZ	Arizona	LFS	WELL	Lacustrine	Sandy	O.R
ATN	Altamont	CL	WELL	Lacustrine/Till	Fine Loamy	O.DG
ASB	Assiniboine	SIC	IMPER	Fluvial	Clayey	GLCU.R
BKA	Birkenhead	LS	M.WELL	Fluviolacustrine	Sandy Skeletal	CA.BL
BKR	Basker	SICL	POOR	Fluvial	Loamy	R.HG
BNE	Bone	VFSL	IMPER	Lacustrine	Coarse Loamy	GL.DG
CAV	Carvey	CL	POOR	Lacustrine/Fluvial	Loamy/Sandy Skeletal	R.HG
CCS	Cactus	LFS	WELL	Lacustrine	Sandy	R.BL
CKD	Crookdale	CL	IMPER	Lacustrine	Fine Loamy/Sandy	GLR.BL
CXF	Carroll	CL	WELL	Lacustrine	Fine Loamy	R.BL
CXV	Charman	CL	IMPER	Lacustrine	Fine Loamy	GL.BL
CXT	Capell	CL	IMPER	Lacustrine/Fluvial	Fine Loamy/Sandy Skeletal	GLR.BL
CXT1	Capell Shaly Variant	CL	IMPER	Lacustrine/Fluvial	Fine Loamy/Sandy Skeletal	GLR.BL
CYN	Croyon	L-CL	WELL	Lacustrine/Fluvial	Loamy/Sandy Skeletal	O.BL
CYN1	Croyon,Shaly Variant	L-CL	WELL	Lacustrine/Fluvial	Loamy/Sandy Skeletal	O.BL
DGF	Darlingford	CL	WELL	Till	Fine Loamy	O.BL
DLN	Danlin	CL	IMPER	Lacustrine	Fine Loamy	GL.DG
DOB	Dobbin	FS	WELL	Lacustrine	Sandy	O.DG
DOT	Dorset	LS	WELL	Fluvial	Sandy Skeletal	O.BL
DRN	Durnan	L	WELL	Lacustrine	Loamy	R.BL
DZW	Dezwood	L	WELL	Till	Fine Loamy	O.DG
ERX	Eroded Slope Complex	Var.	WELL-IMP		Variable	CU.R
FFR	Fifere	L	WELL	Till	Fine Loamy	O.DG
FIR	Firdale	SICL	WELL	Lacustrine	Fine Loamy	O.DG
FND	Fairland	L	WELL	Lacustrine	Loamy	O.BL
FRS	Ferris	CL	IMPER	Till	Fine Loamy	GLR.BL
GBO	Glenboro	L	WELL	Lacustrine	Loamy/Sandy	O.BL
GRO	Grover	L	IMPER	Lacustrine	Loamy/Sandy	GLR.BL
GRR	Guerra	CL	POOR	Lacustrine/Till	Fine Loamy	R.HG
GVS	Gervais	SICL	IMPER	Fluvial	Loamy	GLCU.R

Soil Legend for R.M. OF VICTORIA November 1988

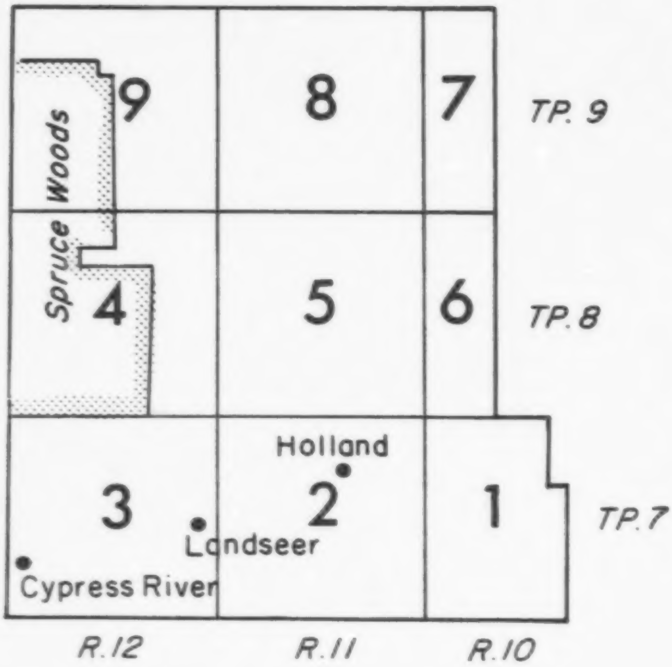
Soil Symbol	Soil Name	Surface Texture	Soil Drainage	Mode of Deposition	Family Particle Size	Subgroup
HAT	Halstead	VFSL	WELL	Lacustrine	Coarse Loamy	O.DG
HEB	Hebbot	CL	WELL	Till	Fine Loamy	R.BL.
HHF	Hochfeld	FSL	M.WELL	Lacustrine	Coarse Loamy	O.BL
HIT	Hilton	L	WELL	Till	Fine Loamy	O.BL
HKS	Hickson	L	POOR	Till	Fine Loamy	R.HG
HMO	Hummerston	LFS	IMPER	Lacustrine	Sandy	GLR.BL
HRG	Harding	C	IMPER	Lacustrine	Clayey	GL.BL
JAY	Jaymar	L	WELL	Fluviolacustrine/Till	Loamy	O.BL
JIK	Janick	C	WELL	Lacustrine	Clayey	O.BL
JYL	Joyale	CL	IMPER	Lacustrine/Till	Fine Loamy	GLR.BL
KIS	Kingsley	L	WELL	Lacustrine/Till	Fine Loamy	D.GL
KUD	Knudson	CL	WELL	Lacustrine/Till	Fine Loamy	O.BL
LEI	Levine	SICL	IMPER	Fluvial	Loamy	GLCU.R
LSL	La Salle	SICL	M.WELL	Fluvial	Loamy	CU.R
LSL1	La Salle,Sandy Var.	LFS	M.WELL	Fluvial	Sandy	CU.R
LSR	Landseer	C	POOR	Lacustrine	Clayey	R.HG
LRY	Leary	LS	WELL	Fluvial	Sandy Skeletal	O.DG
LRY1	Leary,Shaly Variant	LS	WELL	Fluvial	Sandy Skeletal	O.DG
LVH	Lavenham	LFS	IMPER	Lacustrine	Sandy	GL.BL
LWN	Lowton	C	POOR	Lacustrine	Clayey	R.HG
MDN	Marsden	L	POOR	Fluviolacustrine/Till	Loamy	R.HG
MHC	Marsh Complex	Peat	V.POOR		Textural Complex	R.G
MKY	Mockry	LFS	POOR	Eolian	Sandy	R.HG
MOW	Mowbray	SiCL	WELL	Fluvial	Loamy	CU.R.
MRH	Marringhurst	LS	WELL	Fluvial	Sandy Skeletal	CA.BL
MRH1	Marringhurst,Shaly	LS	WELL	Fluvial	Sandy Skeletal	CA.BL
MXT	Melland	L	IMPER	Fluviolacustrine/Till	Loamy	GLR.BL
NKK	Nikkel	CL	IMPER	Till	Fine Loamy	GL.BL
NSH	Narish	CL	POOR	Lacustrine/Till	Fine Loamy	R.HG
NYO	Nayler	L	WELL	Till	Fine Loamy	D.GL

Soil Legend for R.M. OF VICTORIA November 1988

Soil Symbol	Soil Name	Surface Texture	Soil Drainage	Mode of Deposition	Family Particle Size	Subgroup
OBR	Oberon	CL	IMPER	Lacustrine	Fine Loamy/Sandy	GL.BL
OIV	Oliver	C	IMPER	Lacustrine	Clayey	GLBL.SZ
OLK	Ollneck	CL	IMPER	Till	Fine Loamy	GLD.GL
ONH	Onahan	LS	IMPER	Eolian	Sandy	GL.R
PBI	Pembina	CL	WELL	Till	Fine Loamy	D.GL
PDA	Prodan	CL	IMPER	Lacustrine	Fine Loamy	GLR.BL
PER	Perillo	Peat	V.POOR	Organic/Lacustrine	Organic/Loamy	T.M
PPR	Poplar Point	SICL	IMPER	Fluvial	Loamy	GLCU.R
PTR	Petrel	L	IMPER	Lacustrine	Loamy/Sandy	GL.BL
RAM	Ramada	CL	WELL	Lacustrine	Fine Loamy	O.BL
RMP	Rempel	CL	WELL	Lacustrine	Fine Loamy	CA.BL
SEE	Sewell	LFS	POOR	Lacustrine	Sandy	R.HG
SEU	Shellmouth Complex	FSL	WELL	Fluvial	Coarse Loamy	O.R
SGO	Sigmund	C	IMPER	Lacustrine	Clayey	GLR.BL
SHX	Shilox	FS	WELL	Eolian	Sandy	O.R
SXP	Sutton	CL	POOR	Lacustrine	Fine Loamy/Sandy	R.HG
TDP	Tadpole	CL	POOR	Lacustrine	Fine Loamy	R.HG
TGR	Taggart	SIL	IMPER	Lacustrine	Loamy	GLR.BL
TLI	Tellier	CL	IMPER	Lacustrine/Till	Fine Loamy	GL.DG
TOC	Torcan	SIL	IMPER	Lacustrine	Loamy	GL.BL
ULH	Ullrich	CL	IMPER	Lacustrine/Till	Fine Loamy	GL.BL
VDL	Vandal	L	WELL	Lacustrine/Fluvial	Coarse Loamy/Sandy Skeletal	O.DG
VDL1	Vandal,Shaly Variant	L	WELL	Lacustrine/Fluvial	Coarse Loamy/Sandy Skeletal	O.DG
VDS	Vordas	SIL	POOR	Lacustrine	Loamy	R.HG
VTL	Vartel	L	IMPER	Lacustrine/Fluvial	Loamy/Sandy Skeletal	GL.DG
VTL1	Vartel,Shaly Variant	L	IMPER	Lacustrine/Fluvial	Loamy/Sandy Skeletal	GL.DG
WIK	Winkler	C	WELL	Lacustrine	Clayey	O.BL
WWB	Willowbend	L	POOR	Fluvial	Loamy	R.HG
WWD	Wellwood	CL	WELL	Lacustrine	Fine Loamy/Sandy	O.BL
XVI	Xavier	Peat	V.POOR	Organic	Mesic Peat	TY.M

Appendix G

SOIL INDEX MAP


Spruce Woods
9
8
7
TP. 9
4
5
6
TP. 8
Holland
3
2
1
TP. 7
Landseer
Cypress River
R. 12
R. 11
R. 10

MAPS
NOT
FILMED

CARTES
OMISES